

Whole of government obesity prevention interventions: a rapid review

T Gill
D Hector
C Rissel
K Trieu
A Zhong
B O'Hara
A Bauman

An **Evidence Check** review brokered by the Sax Institute for the ACT Government

January 2013

This rapid review was brokered by the Sax Institute.

This report was prepared by:

Tim Gill, Debra Hector, Chris Rissel, Kathy Trieu, Amy Zhong, Blythe O'Hara and Adrian Bauman.
Prevention Research Collaboration, Sydney School of Public Health, University of Sydney.

January 2013

© The Sax Institute 2013

This work is copyright. It may be reproduced in whole or in part for study training purposes subject to the inclusion of an acknowledgement of the source. It may not be reproduced for commercial usage or sale. Reproduction for purposes other than those indicated above requires written permission from the copyright owners.

Enquiries regarding this report may be directed to the:

Manager
Knowledge Exchange Program
Sax Institute
www.saxinstitute.org.au
knowledge.exchange@saxinstitute.org.au
Phone: +61 2 95145950
Fax: +61 2 95145951

Suggested Citation:

Gill T, Hector D, Rissel C, O'Hara B, Bauman A. Whole of government obesity prevention interventions: an Evidence Check rapid review brokered by the Sax Institute (<http://www.saxinstitute.org.au>) for the ACT Government, 2013.

Disclaimer:

This **Evidence Check** Review was produced using the Evidence Check methodology in response to specific questions from the commissioning agency. It is not necessarily a comprehensive review of all literature relating to the topic area. It was current at the time of production (but not necessarily at the time of publication). It is reproduced for general information and third parties rely upon it at their own risk.

Contents

EXECUTIVE SUMMARY	5
Summary of recommendations.....	7
1 The processes in generating this report	10
Project brief.....	10
Literature search strategy	10
Categories of evidence.....	11
Outcomes of evaluated strategies.....	13
Identification of promising strategies.....	14
Assessment of the merit of identified interventions.....	15
References.....	16
2 Regulatory approaches to healthy eating and active living	17
Identification of potential strategies to encourage healthy eating	18
Analysis of research evidence on legislative or regulatory interventions to improve diet.....	18
Identification of potential strategies to encourage active living	29
Analysis of research evidence on legislative or regulatory interventions to encourage active living	29
Recommendations	35
References.....	37
3 Active transport interventions	43
Identification of potential strategies.....	43
Analysis of research evidence.....	44
Recommendations	52
What are the evaluation tools which ACT could use to determine the effectiveness of such interventions?	53
Critical review of ACT plan in terms of its IMPLEMENTATION and make recommendations on the suitability of evaluation tools for its evaluation and feasibility of evidence based programs to fit into the ACT plan.....	53
References.....	54

4 Workplace interventions	56
Description of search methods.....	56
Scope of the literature.....	56
Analysis of research evidence.....	57
Evidence of effectiveness of specific interventions	61
Recommendations	75
References.....	76
Appendices	82
Appendix 1:Tabulation of the relevant evidence papers.....	83
Table1. Legislative or regulatory interventions to decrease consumption of energy dense nutrient poor food and drinks, and/or increase consumption of vegetables and fruit	84
Table 2. Reviews of changes to the physical environment and physical activity	96
Table 3. Evidence summary active transport	101
Table 4A Summary of reviews of interventions to increase physical activity and improve diet (and weight outcomes) in and via the workplace.....	119
Table 4B Summary of reviews contained in the grey literature on interventions to increase physical activity and improve diet (and weight outcomes) in and via the workplace ..	135
Table 4C Summary of single studies (published 2010–2012) aimed to increase physical activity and improve diet (and weight status) in and via the workplace	146
Appendix 2: Additional information pertaining to workplace interventions	177
Best practice elements of workplace health promotion (at the individual organisation or program level)	177

EXECUTIVE SUMMARY

The Prevention Research Centre at the University of Sydney was contracted by the Sax Institute to produce a rapid overview of appropriate whole of Government obesity prevention interventions for the Health Directorate of the ACT Government.

The project brief required that the review identify interventions that the ACT could feasibly implement to: increase levels of physical activity; decrease consumption of energy dense nutrient poor food and drinks, and/or increase consumption of fruit and vegetables; increase the proportion of the ACT population walking, cycling and using public transport for travel; and to identify the most effective workplace-based interventions to achieve these objectives. Additional questions were later added at the request of ACT Health, to describe the potential for behavioural economic approaches to physical activity interventions and to identify regulatory actions to address healthy eating currently under consideration at a national level.

Evidence was identified, collated, assessed and interpreted in a logical and organised manner utilising a system based on previous work by the Prevention Research Collaboration. We utilised a variety of systematic and intuitive search strategies to identify evidence from the published scientific literature as well as the government and NGO reports. We also identified a series of reports from significant health agencies and looked for consistency of recommended actions from these organisations. Of particular interest were policy documents from state, county and city governments such as New York City, London, San Diego City of Greater Geelong and Texas. In addition major policy documents addressing actions to control obesity at a local government level were produced by the US Institute of Medicine, the UK National Institute for Clinical Excellence and Practice, the UK Foresight project, the Scottish Government, the Public Health Agency of Canada, The US Centers for Disease Control and Prevention, World Cancer Research Fund and the Australian National Preventive Health Taskforce.

In defining the evidence base, we tried to identify information from observational and experimental studies where suitable. However, we also included data obtained by extrapolation, deduction or logic, theoretical or accumulated understanding in line with previous evidence frameworks we have published. It was accepted that, whilst the finding of the project would be used to assist in the formulation of obesity-prevention strategies, that the outcomes most reported in evaluation of such intervention were mostly likely to relate to the behaviour itself rather than changes in weight status.

The merit of different types of interventions was defined using the “level of promise” evidence assessment approach which is a product of the strength and level of confidence in the evidence and the efficacy, reach and uptake of the intervention. Although the assessment of merit is based on explicit processes, there remains an element of subjectivity with this classification approach.

High quality evidence around legislative or regulatory interventions to increase active travel and physical activity, decrease consumption of energy dense nutrient poor food and drinks, and/or increase consumption of vegetables and fruit was hard to identify from the literature. There were only a limited number of reviews addressing such interventions and very little controlled experimental studies. There was a much larger body of evidence around interventions within the worksite.

Regulatory or legislative approaches to facilitating healthy eating and addressing obesity relate to three key areas although other potential options remain unexplored. These include; (1)

Improving the access to healthy foods and/or reducing access to unhealthy foods and beverages; (2) influencing food purchasing and consumption behaviours; (3) food and nutrition policies and guidance. The most promising and consistently reported regulatory strategies to address healthy eating include: improving the quality of foods in retail and quick service food outlets; improving the availability and access to plain drinking water; improving point of purchase nutrition labelling; reducing point of purchase marketing of energy-dense, nutrient-poor (EDNP) foods; restricting the portion size of single serve EDNP snacks and drinks; and mandating strong nutrition standards for food and beverages in government-run facilities.

The evidence base around regulatory or legislative strategies to promote physical activity and active transport are even more limited, with most of the published literature being conceptual rather than evaluations of interventions. Regulatory and environmental strategies to mandate physical activity allocations and improve facilities within schools have the strongest evidence base but this is likely a product of the ease of research. Regional or municipal physical activity plans and strong planning regulations around open space, parklands, footpaths and cycle ways are also important strategies to increase physical activity. In addition improving stair use may have some impact.

Strategies to increase the proportion of the ACT population walking, cycling and using public transport for travel mesh very closely with those required to increase physical activity in general. Cycling, walking and public transport are the main forms of active travel and regulatory approaches that improve availability and access to appropriate infrastructure are the most important strategies to encourage these modes of travel. In addition, traffic calming and safety measures in residential streets have potential to remove some existing barriers and provide more confidence in the safety of cycling and walking. Comprehensive behavioural programs to reduce car use (such as the TravelSmart program) have been shown to be effective at reducing car trips and increasing active forms of travel. Likewise establishing "safe routes to school" through small engineering or infrastructure changes also encourages greater active travel to school and formal workplace planning around travel to and from work supports greater employee use of active travel. Subsidising public transport costs may also be a useful strategy.

There has been a considerable amount of research work around effective workplace strategies for promoting healthy eating and physical activity. Much of this work remains accessible only through reports from government agencies and non-government organisations within the grey literature. This information broadly supports the effectiveness of multi-component programs using environmental and/or policy changes in addition to individual-level strategies on improving fruit and vegetable intake, reduce fat intake and increase physical activity. A number of features of successful workplace health programs have also been identified. The most successful workplace programs usually include individual health risk assessment followed by individualised counselling and access with a range of education and behaviour change classes/programs. These are reinforced by environmental change within the workplace to provide change and storage facilities, flexible working hours, point of purchase marketing of healthy foods, changes to the content and pricing of canteen menus and access to exercise facilities. Rewards and incentives for participation and achievements within the program also help sustain involvement. In line with recommendations from the regulatory strategies to promote healthy eating and active living, addressing access and availability and cost issues within the workplace have also been shown as important strategies.

This report has addressed some specific questions in relation to the prevention of obesity within the ACT. It is important to understand that the drivers of obesity within the community are many and complex. A number of reports have attempted to document the wide range of behavioural, cognitive, biological and environmental factors which influence energy balance at an individual or population level. Thus a wide range of interventions will be required to be integrated into a comprehensive program of action to tackle the problem. No single intervention will be sufficient

alone to allow the community to return to energy balance, but a portfolio of actions may make progressive contributions to a solution.

Summary of recommendations

Nutrition

1. Develop mandatory nutrition standards for foods and beverages available in government-run or regulated services, programs and facilities including child care, preschool, schools and after-school care as well as government run recreation centres and venues
2. Ensure that local government agencies that operate cafeterias and vending options have strong nutrition standards in place wherever foods and beverages are sold or available
3. Institute or expand a program of point-of-purchase food or menu labelling in fast food outlets and supermarkets
4. Develop an ACT food and nutrition plan which addresses the local production, distribution, marketing, processing and sale of food and beverages within the ACT
5. Work with local food vendors to improve the quality and availability of healthy food and beverage options which are sold in an appropriate portion size
6. Improve the availability, access and quality of free drinking water in public places and schools
7. Mandate the availability of drinking water in all venues providing food

Physical activity

8. Integrate and prioritise recreational cycling and pedestrian needs into the transport master plan
9. Ensure that all new and renewal planning development projects include:
 - A network of sidewalks and street crossings that creates a safe and comfortable walking environment and that connects to schools, parks, and other destinations
 - Streetscapes within residential areas to reduce vehicle speeds, accommodate bicyclists, and improve the walking environment
10. Plan, build, and maintain a network of trails and paths for pedestrians and bicyclists that are separated from traffic but well connected to transport and other community facilities
11. Build and maintain parks and playgrounds that are safe and attractive for playing, and in close proximity to residential areas. Improve park security through co-ordinated community policing or other security measures
12. Support and encourage the establishment of affordable after-school and weekend activity programs that provide recreational, sporting or supervised play opportunities. It may be necessary to consider regulatory and legislative options to address liability issues that might block implementation
13. Define regulations that mandate minimum play space, physical equipment, and duration of play in preschool, after-school, and child care programs. Regulations should also be developed to limit screen time in preschool and after-school programs
14. Develop worksite policies and practices that build physical activity into routines (for example, exercise breaks at a certain time of day and in meetings or walking meetings)

15. Improve stairway access and appeal, and promote their use especially in places frequented by younger persons

Active Transport

16. Ensure a central focus on active travel within transport and infrastructure master-plans to ensure an appropriate level of investment in active travel infrastructure such as footpaths, cycle paths, traffic calming etc. The provision of adequate levels of public transport to all districts of the ACT also needs to be a key focus on these plans
17. Continued investment in the development of a network of linked walking and cycling paths **separated** from motorised traffic
18. The maintenance and expansion of existing comprehensive car use reduction (TravelSmart) activities. A combination of communication, behavioural change and structural change strategies are necessary to achieve change
19. Ensure an ongoing program of cycling and walking events to encourage the trialling of new transport behaviours
20. Develop and test behavioural economic approaches to integrated active travel interventions, with subsidies, reinforcers and rewards, facilitative timetabling and travel planning schedules and social marketing of the initiative
 - Consider the introduction of employer subsidies of travel passes (for all government employees) to reduce financial barriers to using public transport and encourage use on weekends
 - Require the development of organisational travel plans for all government agencies and encourage, through rewards, this activity in all private ACT medium-large businesses
21. Plan, fund and maintain a program of action that enables the development of safe routes to school for all ACT schools to overcome the physical dangers discouraging parents from allowing their children to actively travel
22. Implement a bicycle share scheme to encourage active travel on small trips between major centres within the ACT
23. Consider the potential gains and risks from making exemptions for adults within the bicycle helmet laws for adults on shared paths, footpaths, and roads less than 40km/hour

Workplace interventions

24. Implement and evaluate flexible work hours policy: including breaks (including short breaks) for participation in physical activity and active transport [evaluate impact on physical activity and active transport]
25. Create environmental supportive of healthy eating including:
 - Implementation of healthy food and beverage policies and practices (catering for meetings and events; fundraising; canteens, vending machines)—to reduce availability of unhealthy foods and increase availability of healthier foods [evaluate policy implementation]
 - provide free fruit
 - establish links with local producers for onsite 'farmers markets'
 - provide easily accessible fresh, cooled water
26. Create environments supportive of physical activity (and active transport) wherever possible, including:

- Lockers, bike racks, showers, change facilities, stair signage [point of decision prompts]
 - Partner with fitness facilities for free or subsidised gym membership or provide onsite physical activity facilities (gyms, walking paths) in larger workplaces
 - Promote lunchtime walking opportunities
 - Promote reduced sitting time, e.g. via standing meetings, standing phone calls, sit-stand desks
27. Implement wide-scale health risk assessment screening (with incentives for participation) and offer follow-up support for those at risk. This follow-up support would most feasibly be via telephone, e.g. referral to the ACT Get Healthy Information and Coaching Service, but would involve at least an initial one-on-one, face-to-face meeting with a dietician and/or exercise physiologist (regular follow-up meetings would be preferable but cost-effectiveness uncertain)
28. Run worksite healthy living competitions and challenges as part of multi-component programs and involve families. Use incentives to increase participation and encourage behaviour change; incentives could include financial rewards, days off, employee recognition, medical insurance premium contributions
29. Introduce an awards system for successful implementation of workplace health promotion policies and practices.

1 The processes in generating this report

The Prevention Research Centre at the University of Sydney was contracted by the Sax Institute to produce a rapid overview of appropriate whole of Government obesity prevention interventions for the Health Directorate of the ACT Government.

Project brief

The project brief required that the review identify interventions that the ACT, a City-State government including functions of both local and state government, could feasibly implement to increase levels of physical activity, decrease consumption of energy dense nutrient poor food and drinks, and/or increase consumption of fruit and vegetables across the ACT population.

The brief required the review to address three specific questions:

Question 1

What are the most effective legislative or regulatory interventions for Governments to use (at a Local, State and/or City level) to increase levels of physical activity, decrease consumption of energy dense nutrient poor food and drinks, and/or increase consumption of vegetables and fruit across the population of the ACT?

Question 2

What are the most effective interventions for Governments (at a Local, State and/or City level) to deliver active transport programs and infrastructure to increase the proportion of the ACT population walking, cycling and using public transport for travel?

Question 3

What are the most effective workplace-based interventions (for example, programs and services, environmental modifications, regulation) to increase physical activity, decrease consumption of energy dense nutrient poor foods, and/or increase consumption of vegetables and fruit across the working population of the ACT?

The project was undertaken between November and December 2012. An additional question was added at the request of ACT Health, to describe the potential for behavioural economic approaches to physical activity interventions. This was added as a narrative description of the few primary studies, as there were too few for review papers to have been written to date.

The rapid nature of this process and the request for a focus on practical evidence-informed recommendations rather than a comprehensive primary review of the literature limit the depth at which each possible intervention area has been explored and mean that this report may not address all possible intervention actions reported in the literature.

Literature search strategy

This report is based on literature reviews, reports and policy documents produced or published between 1980 and November 2012 with a focus on published literature from 2000 onwards. A series of search strategies were defined to try to capture all recent reviews evaluating

interventions addressing obesity-related behaviours as well as structural and environmental changes.

a. Selective literature review with a focus on:

- (i) Reviews of reviews
- (ii) Systematic reviews
- (iii) Recent publications on significant obesity prevention initiatives.

The first phase of this scan involved a full systematic search of the literature using defined search terms (Medical Subject Headings (MeSH) terms overweight, obesity, obese, intervention with a range of intervention types and settings) and publication selection processes. The following electronic databases were searched: Pubmed, Medline, Embase, and PsychInfo. This search yielded a significant number of returns for search terms relating to behavioural interventions of those carried out in an everyday life setting, but was less productive in identifying reviews or recent reports of single studies evaluating the impact of a structural or environment intervention on weight status or behaviour change.

b. Harvest evidence from health policy and evidence assessment agencies

This strategy proved particularly rewarding and returned a number of evidence summaries and policy briefs in addition to existing systematic reviews of the literature

Sites that we utilised included:

- Australia: Our previous reports, NHMRC, National Preventative Health Task Force
- United Kingdom: NICE, HTA, FSA, Scottish Government
- Europe: WHO Europe, EU HOPE Project
- United States: IOM, CDC, Robert Wood Johnston
- Canada: Health-Evidence-Ca. Public Health Agency of Canada
- International: OECD.

c. Scan of existing national and regional obesity prevention strategies and policies

This approach yielded a list of proposed and evaluated strategies plus links to additional evidence assessments undertaken to support the policy development.

d. Hand searching of quoted papers and reports.

Categories of evidence

In this project we have tried to produce an evidence base in relation to information from observational and experimental studies where suitable. However, because this approach can be extremely limited and does not necessarily provide an appropriate basis for identifying the overall impact of complex community interventions, other forms of evidence have also been incorporated into the assessments of effectiveness and feasibility. Thus, the analysis of intervention research has also considered evidence as proposed under our previous work (Gill et al. 2005) and that of the International Obesity Task Force (IOTF) Framework (Swinburn et al. 2005).

These include:

a. Observational studies

(i) Observational epidemiology

Epidemiological studies that do not involve interventions, but may involve comparisons of exposed and non-exposed individuals e.g. cross-sectional, case-control, or cohort studies

(ii) Monitoring and surveillance

Population-level data that are collected on a regular basis on an ecologic level [supra individual level] to provide time series information e.g. mortality and morbidity rates, food supply data, car and TV ownership, birth weights and infant anthropometry

b. Experimental

(i) Experimental studies

Intervention studies where the investigator has control over the allocations and/or timings of interventions e.g. randomised controlled trials, or non-randomised trials in individuals, settings, or whole communities

(ii) Program/policy evaluation

Assessment of whether a program or policy meets both its overall aims (outcome) and specific objectives (impacts) and how the inputs and implementation experiences resulted in those changes (process evaluation of the implementation of policy or program components)

c. Extrapolated

(i) Effectiveness analyses

Modelled estimates of the likely effectiveness of an intervention that incorporate data or estimates of the programme efficacy, programme uptake, and (for population effectiveness) population reach

(ii) Economic analyses

Modelled estimates that incorporate costs (and benefits), e.g. intervention costs, cost-effectiveness, or cost-utility

(iii) Indirect (or assumed) evidence

Information that strongly suggests that the evidence exists, e.g. a high and continued investment in food marketing is indirect evidence that there is positive (but proprietary) evidence that the food marketing increases the sales of those products and/or product categories within that target audience

d. Experience

(i) Parallel evidence (analogous studies)

Evidence of intervention effectiveness for another public health issue using similar strategies, e.g. the role of social marketing or policies or curriculum programmes or financial factors on changing health-related behaviours such as smoking, speeding, sun exposure, or dietary intake. It also includes evidence about the effectiveness of multiple strategies to influence

behaviours in a sustainable way, e.g. health-promoting schools approach, comprehensive tobacco control programmes, or co-ordinated road toll reduction campaigns

(ii) Theory and programme logic

The rationale and described pathways of effect based on theory and experience, e.g. linking changes in policy to changes in behaviours and energy balance, or ascribing higher levels of certainty of effect with policy strategies like regulation and pricing compared with other strategies such as education

(iii) Informed (expert) opinion

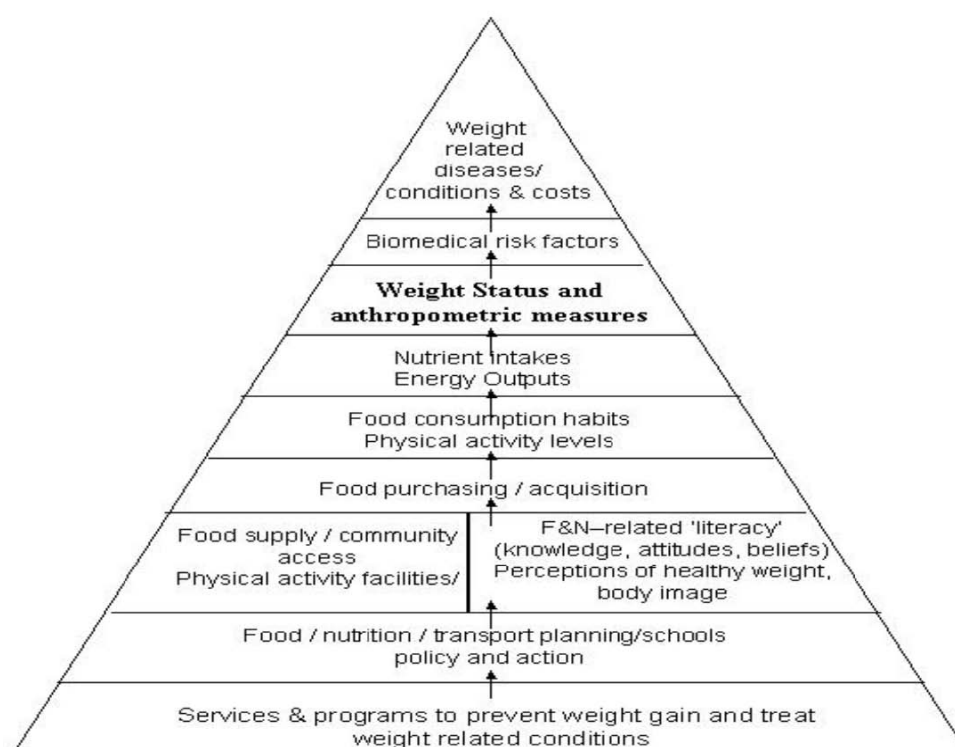
The considered opinion of experts in a particular field, e.g. scientists able to peer review and interpret the scientific literature, or practitioners, stakeholders, and policy-makers able to inform judgements on implementation issues and modelling assumptions (incorporates 'expert' and 'lay knowledge').

Outcomes of evaluated strategies

In discussions with the Health Directorate of the ACT Government it was accepted that it is difficult to evaluate the outcome of whole of government approaches to obesity in terms their direct impact on weight status. Few interventions are capable of reducing energy intake or increasing energy expenditure sufficiently, or for long enough, to achieve a return to energy balance within evaluation timeframes. The conceptual framework for monitoring weight and related variables presented in Figure 1 (Gill et al. 2005) can serve as a useful guide for measuring 'lower order outcomes' desired by preventive programs. Changes in dietary and physical activity behaviours have been shown to precede changes in weight status in adults and children, and can be detected within a timeframe of one to two years. If changes in diet, physical activity or sedentary behaviours are large enough to impact positively on improved energy balance, then these may serve as useful intermediary outcomes. Also, important 'process evaluation' indicators such as measured changes in policies, services, professional practices and community facilities, can be used to show that preventive programs are being implemented as planned, which is an important first step in the lead up to dietary and physical activity changes in the population.

Appendix 1 provides the tabulation of key research reviews and articles utilised for this report.

Figure 1 A conceptual framework for monitoring Weight & related variables



Source: Gill et al. 2005

Identification of promising strategies

The usual approach to identifying promising strategies is to undertake a review of the literature and ascertain those interventions that have sufficient evidence to support their efficacy. However, in defining regulatory, environmental or whole of government strategies to address obesity this does not prove to be a very instructive process. Even when the definition of evidence is broadened beyond NHMRC categories or when intermediary or process outcomes are utilised very few promising interventions are identified. This is because many of these interventions cannot be evaluated effectively by traditional research designs or comprehensive programs of action cannot be disaggregated to identify the impact of any one strategy. In addition, many of the actions addressed within this report impact on weight status by enabling or amplifying behaviour change rather than directly impacting on that behaviour.

To avoid merely identifying those very limited number of strategies that have efficacy data to support them, this report utilised a dual system of evidence assessment. Whilst undertaking traditional systematic evidence search strategy of published and grey literature, we also identified a series of reports from significant health agencies that have made recommendations on these areas of action. This allowed us to identify recommended strategies consistently proposed by health agencies (usually based on logic but sometimes supported by evidence) and to utilise an evidence review to assess the quality of evidence to support such actions. This approach allowed us to avoid the inclusive or null finding of most traditionally conducted systematic reviews within these domains of action on obesity.

Assessment of the merit of identified interventions

The collection, collation and summary of all the relevant evidence around the effectiveness of an intervention within the evidence summaries, makes the process of assessing the merit of each intervention simpler. As discussed in section 1.3, traditional hierarchies of evidence are less relevant in defining the relative merit of specific interventions to prevent or manage obesity. Whilst studies with controlled experimental designs have strong internal validity, they provide only one piece of the jigsaw of evidence that is available to more completely define the potential public impact of an intervention.

That is why we chose to utilise a composite measure based on the quality and quantity of evidence available around its effectiveness (which we defined as the “level of confidence in the evidence” together with an assessment of the potential of the intervention to contribute to achieving energy balance). This approach was based on our previous efforts to define the promise of an intervention as a product confidence in the evidence and the efficacy, reach and uptake of the intervention (Gill et al. 2005). This format is similar to the one used within the recent World Cancer Research Fund policy report (WCRF, 2009) and is flagged within the Institute of medicine report – *Bridging the Evidence Gap in Obesity in Obesity Prevention* (IOM 2010). The ability to contribute to the achievement of energy balance was seen as the most appropriate outcome to assess.

This allows an assessment of potential change based on evidence of effectiveness in either weight or behaviour change and also accepts that some interventions act by enabling or reinforcing the changes achieved by other interventions. Although the assessment of merit is based on explicit processes, there remains an element of subjectivity with this classification approach.

Table 1. The promise matrix

Certainty of effectiveness* (Risk)	Potential population impact^ (return)		
	Low	Moderate	High
Quite high	promising	very promising	most promising
Medium	some promise	promising	very promising
Quite low	least promising	some promise	promising

*-The confidence from the evidence that the intervention will produce a benefit under ideal conditions

^ -Efficacy x (population reach x uptake)



References

1. Gill T, King L, Webb K. Best options for promoting healthy weight and preventing weight gain in NSW. Sydney: NSW Centre for Public Health Nutrition, 2005.
2. Institute of Medicine (IOM). Bridging the evidence gap in obesity prevention: a framework to inform decision making. Washington DC: The National Academies Press, 2010.
3. Swinburn B, Gill T, Kumanyika S. Obesity prevention: a proposed framework for translating evidence into action. *Obes Rev* 2005;6:23–33.
4. World Cancer Research Fund (WCRF). Policy and action for cancer prevention. Food, nutrition, and physical activity: a global perspective. Washington DC: American Institute for Cancer Research (AICR), World Cancer Research Fund (WCRF), 2009.

2 Regulatory approaches to healthy eating and active living

Research question: What are the most effective legislative or regulatory interventions for Governments to use (at a Local, State and/or City level) to increase levels of physical activity, decrease consumption of energy dense nutrient poor food and drinks, and/or increase consumption of vegetables and fruit across the population of the ACT?

There are many ways to classify and categorise regulatory and legislative approaches to promoting physical activity and healthy eating. We define 'policies' as 'decisions, recommendations and guidelines formulated by (a branch of) government'; policies are distinct from legislation, which is concerned with the elaboration and enactment of laws by a legislative body (Bellew 2011). Policies may be implemented at the national or local level, and may range from regulations (suggested rules) through to more specific interventions or health promotion programs. (Bellew 2011, Nethe et al. 2011).

One typology that may be useful is to use three categories, which although not completely mutually exclusive, do delineate different approaches within this domain of work. These three categories are:

1. Legislative approaches to promoting physical activity and healthy eating which involves the enactment of mandatory legislation with a direct relevance to the promotion of physical activity; this is codified and mandated legislation.¹
2. Regulatory and policy approaches that have relevance to physical activity and healthy eating, that may be legislated, but are not mandatory and can be implemented differentially in different settings.
3. Environmental change approaches that promote the physical environment, built environment or physical infrastructure that might have a relevance to the promotion of physical activity or the provision to or access to healthy foods. This could be through the enactment of legislation or regulatory or policy approaches, or neither of those, but result in improvements to the physical environment that may impact on physical activity and nutrition.

In this document we develop a typology of regulatory and policy approaches to promoting physical activity and healthy eating that is evidence-informed, clearly categorises different sets of activities, and provides a framework for understanding these approaches to promoting physical activity and healthy eating. This is different to the usual conflation of environment and policy and legislative approaches in one category.

¹ There are numerous examples of tobacco control specific legislation; examples with a specific influence on physical activity are sparse. These are presented in the tables, but internationally are more theoretical than actually planned.

Identification of potential strategies to encourage healthy eating

Potential regulatory and legislative interventions aimed at improving the intake of fruit and vegetables or reducing the intake of energy dense nutrient poor food and drinks were identified by marrying information obtained from a selective literature review with recommended actions from recent policy and guidance documents produced by a range of government and non-government agencies. Special attention was paid to identifying recommendations for action at a local government or state level to ensure the relevance of these recommendations to the opportunities available to the ACT Government. Recommended actions identified in multiple reports were then assessed for the evidence base to support their implementation.

Of particular interest were policy documents from state, county and city governments such as New York City (NYC Obesity Taskforce 2012), London (Libman et al. 2010) and San Diego (San Diego County 2010), City of Greater Geelong (2009) and Texas (Texas Department of State Health Services 2008). In addition, major policy documents addressing actions to control obesity at a local government level were produced by the US Institute of Medicine (IOM 2009), the US Healthy Eating Active Living Convergence Partnership (Lee 2008), the UK National Institute for Clinical Excellence and Practice (NICE 2009), the UK Foresight project (Butland et al. 2007), the Scottish Government (2010), the Public Health Agency of Canada (2011), The US Centers for Disease Control and Prevention (Kahn et al. 2009), World Cancer Research Fund (WCRF 2009) and the Australian National Preventive Health Taskforce (2009).

Analysis of research evidence on legislative or regulatory interventions to improve diet

High quality evidence around legislative or regulatory interventions to decrease consumption of energy dense nutrient poor food and drinks, and/or increase consumption of vegetables and fruit was hard to identify from the literature. There were only a limited number of reviews addressing such interventions and very little controlled experimental studies. There was a range of evidence to support the merit of such interventions including program evaluations, observational epidemiology, parallel evidence, theory and program logic and extrapolated or indirect evidence.

Access and availability of healthy/unhealthy foods

The most frequently cited recommendations around regulatory approaches to addressing obesity relate to improving the access to healthy foods and/or reducing access to unhealthy foods and beverages. However, few studies have evaluated strategies for improving access to healthy, affordable foods and reducing access to high-calorie, low-nutrient foods. Several strategies and actions have been proposed to attract supermarkets to underserved neighbourhoods, improve the availability of healthy foods such as fruits, vegetables and whole grain products, and reduce access to energy-dense foods in fast food establishments and restaurants.

The majority of studies that have examined the relationship between store access and dietary intake find that better access to a supermarket or large grocery store is associated with healthier food intakes (Larson et al. 2009). Supermarkets are now the dominant setting for purchase of most foods. Studies for the US suggest that obesity prevalence increased and fruit and vegetable consumption decreased with increasing distance to supermarket in metropolitan areas, but not in non-metropolitan areas. Data from the UK does not support such an association. Larger

grocery shops generally have greater availability, lower costs and better-quality fresh produce than smaller grocery stores. Nevertheless, some small specialist stores (such as greengrocers and market stalls) appear to offer cheaper prices for fruits and vegetables than supermarkets (White et al. 2004). Research consistently demonstrates that car ownership and use of a car to buy food is socioeconomically patterned and that this is a key determinant of access to food stores (Shepherd et al. 1996, Guy et al. 2004, Mooney 1990, Donkin et al. 2000, Lang and Caraher 1998, Robinson et al. 2000, Clarke et al. 2002). Carrying shopping, as well as the problems of storage, remain important barriers to accessing supermarkets by specific socio-demographic groups, including older people, people without cars and in poor housing (Bromley and Thomas 1993, Lang and Caraher 1998, Guy and David 2004).

Two UK studies (Leeds, Glasgow) have evaluated the impact of opening a new supermarket in an underserved location (Wrigley 2003, Cummins et al. 2005). Results showed that shopping behaviour changed, but had only small impact on markers such as improved fruit and vegetable purchases (increased 1/3 serve) which disappeared when controlled for secular change. Studies in the US showed that in metropolitan areas, the odds of obesity increased and the odds of consuming fruit and vegetables five times or more per day decreased as distance to supermarkets increased. This was not the case, however, in non-metropolitan areas (Michimi and Wimberly 2010). Very little work has focussed on strategies to attract supermarkets into underserved neighbourhoods. A survey of city planners in 32 communities in the US identified a range of options to attract supermarkets to underserved areas. However, only three cities reported successfully implementing systematic efforts to establish new supermarkets (Pothukuchi 2005). Data from the US shows that obesity among black and white Americans was associated with lower numbers of supermarkets and higher numbers of convenience stores in census tracts. However, there was no evidence that individuals shopped within their own census tracts, and these results may be confounded by the socioeconomic characteristics of neighbourhoods.

In disadvantaged areas with distant supermarkets, small stores may act as a substitute for sourcing groceries and consequently may have an important role to play in influencing consumption. Stores in more deprived areas generally have low quality fresh produce compared to stores in more affluent areas. Food quality may influence food purchase and consumption and help partially explain neighbourhood differences in food consumption patterns. A number of small poorly controlled studies in the US have examined the impact of reducing unhealthy and improving healthy food options in convenience stores (Ayala et al. 2009, Gittelsohn 2009). One trial was able to demonstrate a one serve increase in fruit and vegetable consumption (over the controls), following the introduction of a range of fresh produce packs into selected stores. Farmers' markets and mobile market stalls have the potential to increase fruit and vegetable consumption by increasing availability in socially disadvantaged areas with poor access to healthy foods. A recent review of the nutritional impact of farmers' markets in the US showed that shopping at farmers' markets generally increased consumption of fruit and vegetables (McCormack et al. 2010). However, the studies included in the review assessed the impact of the markets on fruit and vegetable consumption among participants involved in monetary incentive programs. To date, no studies have assessed the effects of a farmers' market on diet without the use of incentives. Community gardens and garden-based nutrition intervention programs may also have the potential to promote increased fruit and vegetable intake (Alaimo et al. 2008) and may increase willingness to taste fruits and vegetables among youth (Robinson-O'Brien et al. 2009).

Reducing access to fast food and vending machines may reduce the likelihood of consuming energy-dense nutrient-poor foods. While there is good evidence for limiting fast food consumption, there is no evidence around the impact of reduced access to fast food. Zoning and land use policies that regulate fast food restaurants may affect consumption (Ashe et al. 2003, Paquin 2008). South Los Angeles has introduced regulations to prevent the establishment of any further fast food outlets in the district and will attempt to attract healthier options. However, there have been no evaluations of this or other measures to inhibit access to unhealthy foods.

Arguments against limiting prevalence of fast food restaurants include the argument that access to healthier food alone will not prevent overeating and it may restrict competition (Lawrence and Gostin 2007).

Sugar-sweetened beverage intake is considered an important contributing factor to obesity in childhood (Ludwig et al. 2001, Vartanian et al. 2007). Sugary drinks such as soft drinks have been banned from schools throughout Australia; however these restrictions could be implemented across other institutions e.g. hospitals, sporting venues etc. An alternative strategy would be to improve access to other beverages such as water. A New Zealand intervention study found that children from intervention schools (provided with cooled water filters) reported consuming fewer carbonated beverages, fruit juice/drinks and total sweet drinks compared to controls (Taylor et al. 2007). However, the differences were mainly due to the increased consumption of soft drinks among the control group. Water consumption did not differ significantly between groups post-intervention and BMI was only reduced in those who were not overweight at baseline. It may be that simply increasing access to drinking water is not enough and that drinking water should be accompanied by a reduction in sugary drinks. In fact, replacing sugar-sweetened beverages with water was associated with reductions in total energy intake for children and adolescents (Wang et al. 2009). Installing water fountains in public places and facilities can increase water intake and prevent and reduce overweight and obesity (Muckelbauer et al. 2009). In Sweden it is compulsory to provide access to free water in all venues where food is served, and in certain states in Australia, it is mandatory to serve cold tap water either free of charge or at a reasonable price if the restaurant is licensed to serve alcohol (Department of Racing Gaming and Liquor 2009, NSW Government Legislation Liquor Regulation 2008). Interventions that provide coupons redeemable for healthier foods and bonuses tied to the purchase of healthier foods increase purchase and consumption of healthier foods in diverse populations, including university students, recipients of services from the Supplemental Nutrition Program for Women, Infants, and Children (WIC), and low-income seniors (Anderson et al. 2001, Jeffery et al. 1994, Cincirpini 1984). For example, one community-based intervention indicated that WIC recipients, who received weekly \$10 vouchers for fresh produce, increased their consumption of fruits and vegetables compared with a control group, and sustained the increase six months after the intervention (Herman et al. 2008).

A limited number of studies have attempted to measure the impact of product reformulation on the population intake of key nutrients. For example the UK Food Standard Authority have measured the change in population salt intake (via urinary sodium) pre and post reformulation and demonstrated a reduction in average population sodium intake levels. This has not yet been correlated to health outcomes such as blood pressure or incidence of coronary heart disease and stroke (UK Food Standards Agency 2009). Studies of the impact of nutrition signposting systems in the Netherlands (Vyth et al. 2010) and Australia (Fear et al. 2004) revealed significant improvements through reformulation in products achieving accreditation, resulting in significant reductions in salt, sugar and calories and improvements in fibre content. Most of the data on benefits on weight and health from food product reformulation come from extrapolations and modelling studies. A number of agencies and organisations have made estimates of the likely extent of change to have resulted from product reformulation initiatives they have introduced, or they have extrapolated on the basis of what could be achieved if targets for product change were achieved.

Food purchase and consumption

Consumers make a number of important decisions regarding food products at the point of purchase or point of consumption. As a consequence, there is considerable scope to influence their behaviours at this time. Potential regulatory interventions to influence purchase or consumption of fruit and vegetables or EDNP foods include point of purchase labelling and marketing and portion control.

Menu labelling has great potential to influence the energy consumed through take-away and other food outlets with modelling estimating that a 100kcal reduction in intake in 10% of the purchases from fast food venues would result in a 40.6% reduction in the average weight gain in the (Kuo et al. 2009). However, many assumptions have been made about the efficacy of menu labelling and evaluations of such programs have produced mixed results, with most of the studies of poor methodological quality. Preliminary evaluations of the major menu labelling initiatives in the US, such as New York City, have been mixed, with initial studies indicating increased awareness but little behaviour change, and later studies suggesting small but significant reductions in calorie selection after labelling (RWJF 2009, Elbel et al. 2009) and improvements in general nutritional quality of selections (Bruemmer et al. 2012) and reductions in sugar-sweetened beverage consumption in adolescents (Bleich et al. 2012). A review of 21 studies examined the impact of providing nutrition information on purchasing behaviour among patrons in worksite and university cafeterias and in restaurants and found a positive impact in two thirds of those studies (Harnack and French 2008). Some experimental studies have examined the difference in menu orders made by participants who were provided with either a menu with nutrition labelling or one without. A study conducted in adolescents indicated that when exposed to menu labelling (together with information on daily calorie requirement) they modified their food choices, resulting in a 250 calorie reduction in energy levels in the ordered meal (Roberto et al. 2010). However, two similar studies in adults produced variable results, with males increasing their calorie selection in one study (Clegg et al. for BMRB Social Research 2009).

Supermarket shelf signage or (point-of-purchase signage) have been used in many parts of the world to communicate nutrition information. A range of studies have evaluated the impact of shelf-signage schemes on food selection behaviours. Although the study periods were long (1–2 years after introduction of the scheme) (Lang et al. 2000, Sutherland et al. 2010, Gittelsohn et al. 2009), outcomes assessed were restricted to purchase intentions or behaviours. A recent study in a US college used point of purchase tagging to identify healthier options, and then used computerised sales data to assess its impact on purchases. It found promising but non-significant increases in purchases of the range of tagged items (Dumanovsky et al. 2010).

Numerous systematic reviews have concluded that the marketing of unhealthy (or energy-dense nutrient-poor) foods and beverages to children negatively influences children's eating behaviour, dietary intake and beliefs and purchase requests to their parents (Cairns et al. 2009, Hastings et al. 2003, IOM 2006). Whilst marketing through mass media or the internet is a federal issue, marketing within stores and around schools is within the regulatory control of the ACT Government. Product placement within the supermarket and particularly in the checkout aisles is a key tool for the marketing of EDNP foods and the regular promotion of and excessive shelf space provided to soft drink, crisps and confectionery within supermarkets present opportunities for intervention. In contrast the effective in store promotion of fruit and vegetables can lead to increased sales of these products. Whilst there is very little trial evidence around such interventions a recent report from the British Retail Consortium (2009) indicates the level of improvement in sales data that can accompany such promotional changes. Food marketing around schools was found to be prevalent in a recent Australian study where 25% of all marketing in a 500m radius of schools was for food and 80% of this was for non-core foods (Kelly et al. 2008) highlighting the need for outdoor food marketing policy intervention.

Although reducing portion or pack a size is often promoted as a possible strategy for addressing excessive energy intake, only a few studies have attempted to evaluate its impact. In short term studies where portions of prepared foods were restricted, there was a subsequent reduction in energy intake. One short term study showed that participants who were provided with snack foods in smaller portions consumed around a third less snack food than those given usual size packages, but only in the first week of a two week trial (Steenhuis and Vermeer 2009). Because of their strong link to increasing weight in consumers and other health issues associated with their consumption, there is obvious logic in restricting the portion size of soft drinks. This has been the

basis of the regulation by NYC to limit single portion size for sugary drinks offered and sold in restaurants and other food service establishments.

Food and nutrition policies and guidance

The community generally expects governments to provide direction on key health issues and that state agencies and institutions will operate in a manner consistent with appropriate health behaviours. This particularly applies to key lifestyle behaviours such as smoking, alcohol consumption, diet and exercise (NSW Health 2009). As a result, most governments across the world issue nutrition guidelines or recommendations to assist communities to achieve a healthy diet and maintain an appropriate weight. There has been limited research into the efficacy of issuing general dietary and physical activity guidance. What is available suggest that the public often find such guidance confusing with ambiguous wording and lacking the specificity they require to assist behaviour change (Boylan et al. 2012). Often individuals believe they are eating in line with the guidelines when objective assessment of their diet shows otherwise (Ball et al. 2004).

Most states and territories in Australia and many European and US states have proposed or implemented a set of guidelines for the provision of food within the school, preschool and childcare settings. However few of these initiatives have been evaluated beyond process or impact measures. Findings from NSW and Queensland indicate that strong and clear school canteen guidelines can be effectively introduced and that their implementation can be achieved without additional imposts on school time and services and without loss of canteen profit (NSW Health 2006, Dick et al. 2012). Such guidelines have strong (but not universal support) of parent and teacher organisations but do not align with the usual purchasing patterns of children (Dick et al. 2012). In some parts of the US there has been strong opposition to the imposition of nutrition guidelines on schools as it is viewed as paternalistic and neglecting children's tastes (Howard 2012). Decision-making around food choice can be reflective or impulsive and because healthy eating is not a high priority in older school students then many of their canteen purchases are driven by impulse (Mensink et al. 2012). This makes a strong case for ensuring any guidance around school food services is mandatory.

Some government agencies such as NSW Health and Queensland Health have instituted guidelines that cover the provision of food and catering in all their institutions and offices. In 2009 NSW Health issues a policy directive around the nutritional quality of foods and drinks available to staff and visitors at all NSW Health facilities. The directive required that by a certain time point that no more than 20% of foods sold at outlets within NSW Health facilities (including vending machines) should be EDNP foods; based similar criteria to that used in school canteens (NSW Health 2009). The Queensland Government has also issued catering guidelines for Queensland Health facilities as well as meetings and functions across all government departments (Queensland Government 2009). The guidelines are detailed but did not set definite limits around EDNP foods apart from a recommendation that no EDNP foods should be stocked in vending machines at Queensland Health facilities. An evaluation of Queensland's 'A better choice' details that as a result of the strategy, the availability of nutritious food and drink options increased throughout the state, with 78% of Queensland facilities reporting the implementation of more than half the strategy requirements and 25% reporting full strategy implementation (Queensland Health 2010). Similar guidelines have been issued by various UK National Health Service bodies and are recommended within the UK National Institute for Health and Clinical Excellence obesity prevention guidelines (NICE 2006). A body of UK-based case studies suggests that factors most likely to make a canteen intervention work are: commitment from the top, enthusiastic catering management, a strong occupational health lead, links to other on-site health initiatives, free or subsidised produce and heavy promotion and advertisement at point of purchase (Healthlinks 2003, Holdsworth et al. 2004).

The issue of external 'inappropriate' commercial catering outlets in government and especially health facilities has been raised by a number of commentators with the siting of fast food restaurants within public hospitals in Australia and overseas. A US study compared the fast food consumption patterns and behaviours of parents visiting paediatric hospitals with or without a fast restaurant. They found that having a McDonald's restaurant in the hospital was associated with increased consumption of fast food by outpatients on the day of their visit and was associated with higher ratings of the healthiness of McDonald's food. The respondents from the hospital with an on-site McDonalds were twice as likely to think of MacDonald's food as healthier than the others (Sahud et al. 2006).

Legislative or regulatory interventions to decrease consumption of energy dense nutrient poor food and drinks, and/or increase consumption of vegetables and fruit



Table 2
Access and availability of healthy/unhealthy foods

Recommended actions	Evidence	Level of promise	Commentary/Rationale	Considerations
<p>Improve the quality of foods stocked at retail outlets</p> <p>Create incentive programs to assist small food store owners in underserved areas to offer more healthy affordable food such as providing grants to purchase refrigeration equipment to store fruit and vegetables</p>	<p>Observational reports from the US</p> <p>Limited and lacking quality</p>	promising	In disadvantaged areas with distant supermarkets, small stores may act as a substitute for sourcing groceries and consequently may have an important role to play in influencing consumption. Stores in more deprived areas generally have low quality fresh produce compared to stores in more affluent areas. Food quality may influence food purchase and consumption and help partially explain neighbourhood differences in food consumption patterns	Expensive option that needs close monitoring
<p>Improve the quality of options at prepared food outlets</p>	<p>Small trials in the US</p> <p>Modelling of potential impact</p>	promising	Quick service restaurants and other catering outlets are among the most important and promising venues for environmental, policy, and pricing initiatives to increase intake of healthy food. Unfortunately however, away-from-home foods typically contain more fat and saturated fat and less fibre, calcium and iron than foods prepared at home	<p>This option is more acceptable to food industry and some progress already made</p> <p>Very slow (and sometimes expensive) process</p> <p>Requires ongoing public health investment in monitoring</p> <p>Improved nutrition products often attract a premium in price</p>

Recommended actions	Evidence	Level of promise	Commentary/Rationale	Considerations
<p>Improve access to plain drinking water</p> <p>Adopt codes which ensure water fountains are widely available and accessible in schools and public places</p> <p>Mandate tap water to be freely available in all prepared food outlets</p>	<p>Reviews and evidence summaries</p> <p>Very few intervention studies</p>	promising	<p>Sugar-sweetened beverage intake is considered an important contributing factor to obesity in childhood.</p> <p>Sugary drinks such as soft drinks have been banned from schools throughout Australia; however these restrictions could be implemented across other institutions e.g. hospitals, sporting venues etc. Saying this, it is difficult to directly influence access to soft drinks as they are widely available. An alternative strategy would be to improve access to other beverages such as water</p>	
<p>Reduce number and access to fast food outlets</p> <p>Adopt zoning policies that restrict fast food establishments near school or play grounds or limit the density of fast food establishments in residential communities</p>	<p>Ecological, logic and extrapolated information</p>	promising	<p>The rapid supply and demand for fast food is concerning, as those who consume large amounts of fast food have less healthy nutritional profiles and have a higher risk of adverse health outcomes such as weight gain and diabetes. Reducing access to fast food and vending machines may reduce the likelihood of consuming energy-dense nutrient-poor foods</p>	<p>Perceived as negative action or restriction of freedom</p> <p>Powerful vested opposition</p>
<p>Food voucher schemes</p>	<p>Strong experimental data from US</p>	promising	<p>Low-income individuals are more likely to consume nutrient-poor foods leading to disparities in health such as higher rates of hypertension, diabetes, cardiovascular disease, obesity, and dental disease. Providing monetary incentives to such individuals could encourage consumption of healthier food, thereby helping to reduce the large gap in health inequalities which exist between different socioeconomic groups</p>	<p>Issues of transferability. Gains in the US related to social system with defined benefits rather than general financial support</p> <p>Perceived as paternalistic</p>
<p>Ensure all government owned property has healthful food choices</p> <p>Provide free fresh fruit and vegetable snacks in all schools</p>	<p>Logic and extrapolated evidence</p> <p>Some evaluations of free fruit programs in UK</p>	some promise	<p>Government messages around health need to be reinforced by demonstrating a commitment to these objectives in the actions of its institutions</p>	<p>Government needs to provide leadership</p>

Recommended actions	Evidence	Level of promise	Commentary/Rationale	Considerations
<p>Increase sale of produce directly from growers</p> <p>Promote and support urban agriculture as a health promoting use of green space</p> <p>Create regional infrastructure for production, distribution, and processing of local and regionally grown healthy foods and incentives for its procurement</p> <p>Introduction of a simple permit system for fresh vegetable and fruit carts (NYC)</p>	Farmers markets assessments from US	some promise	Farmers' markets are increasingly popular in Australia with at least 75 farmers' markets in NSW alone. They have the potential to increase fruit and vegetable consumption by increasing availability in socially disadvantaged areas with poor access to healthy foods	<p>Farmers markets remain the domain of better educated Australians</p> <p>Important synergy with economic, agriculture and environmental objectives</p>
<p>Create incentive programs to attract supermarkets and grocery stores to underserved neighbourhoods</p> <p>Use zoning regulations to enable healthy food providers to locate in underserved areas</p> <p>Improve the transport connections to quality retail food outlets</p>	Systematic reviews, Robert Wood Johnson Foundation evidence summaries, single studies	some promise	The availability of particular foods in a neighbourhood is associated with the reported consumption of such foods. Introducing new supermarkets to poorly served areas increases access to a wider variety of healthy food, allowing residents to improve their dietary consumption. The potential benefits of greater local fruit and vegetable availability may be especially pronounced for more disadvantaged households	<p>Important equity issue</p> <p>The extent to which supermarket siting influences Australian shopping patterns and diet is unknown. It appears to most people drive to supermarkets and car ownership or transport options may be more important</p> <p>Exposure to food outlets does stimulate purchase</p>



Table 3
Food purchase and consumption

Recommended actions	Evidence	Level of promise	Commentary/Rationale	Considerations
<p>Improved point of purchase nutrition labelling</p> <p>Menu labelling in chain stores to provide calorie and nutrient information</p>	<p>Systematic reviews, evidence summaries from FSA, CDC, RWJ, WHO and several NGOs</p> <p>Some experimental studies</p>	very promising	Menu labelling has great potential to influence the energy consumed through take-away and other food outlets. The prevalence of obesity has been associated with an increased consumption of energy-dense nutrient-poor foods outside the home. At the same time there have been increases in portion size, and ongoing underestimating of the calorie content of these foods	<p>Nutrition labelling already has high acceptability from industry and consumers</p> <p>Relatively easy and inexpensive to implement as costs are mostly with industry</p>
<p>Reduce point-of-sale marketing of energy dense, nutrient poor foods to children</p> <p>Restrict the marketing of energy-dense, nutrient poor snack foods at checkouts</p> <p>Eliminate advertising of & beverages in public places frequently visited by youths – especially around schools</p>	<p>Very limited intervention studies</p> <p>Some post change purchase data from UK supermarkets</p> <p>Evaluations from US, evidence summaries</p>	promising	A considerable amount of marketing occurs at the point of purchase to encourage unplanned purchases. Much of this marketing is for energy-dense, nutrient poor snacks and drinks. The idea to use supermarket shelf signage or (point-of-purchase signage) has been around for many years, and supermarket shelf-tags have been used in many parts of the world to communicate nutrition information in addition to promoting low nutrition foods	Strong consumer demand for restrictions on marketing
<p>Set appropriate limits to portion sizes of common energy dense nutrient poor snacks and drinks</p> <p>Establish and set a maximum size for sugary drinks sold in restaurants or other food service establishments</p> <p>Work with producers, retailers and caterers to standardize portion sizes in ready meals and restaurants</p>	<p>Systematic reviews of small trials. Action reported in NYC, Europe, Australia</p> <p>Some voluntary initiatives lead by food industry</p>	promising	There has been a rapid growth in the single portion servings of a number of energy dense nutrient poor snacks and drinks. Research has suggested that this contributes to the overconsumption of energy and that a reduction in the portion size of these products can reduce the amount of calories consumed. Strategies to address large portion sizes could include actions by manufacturers (including caterers) to reduce the size of single portion food and beverage products or the education of consumers about appropriate portion size	<p>Strong logic to support action</p> <p>Negative reaction by vested interests and some consumers to NYC initiative</p>



Table 4
Policies and Guidance

Recommended actions	Evidence	Level of promise	Commentary/Rationale	Considerations
<p>Mandate strong nutrition standards for food and beverages in government-run facilities</p> <p>Incorporate the requirements into all tenders, contracts that relate to supply of applicable food and drinks to staff and visitors</p>	<p>Program logic</p> <p>Case studies</p> <p>Evaluation of implemented guidelines</p>	promising	<p>The public expects government agencies to provide leadership and for catering at facilities to reflect existing recommendations</p> <p>Children at school and patients and visitors to health facilities perceive that food served within these setting will be healthy and appropriate</p>	<p>Strong logic supports mandatory standards</p> <p>There is some resistance to changes in existing foods for sale with students, parents and staff</p>

Identification of potential strategies to encourage active living

The evidence base in this sphere of work is limited, with most of the published literature around legislation and regulation being conceptual rather than strong evaluations of interventions. There have been a plethora of epidemiological studies of associations between physical activity and the built environment, but almost all of these 300 plus studies use a cross sectional design and very few interventions have been published. A systematic review of this large body of research is beyond the scope of this review, but illustrative examples will indicate the effects of changes to the built environment infrastructure and their impact on physical activity using findings from longitudinal studies, quasi experimental evaluations, and opportunistic assessments of natural experiments.

A tabulation of the kinds of work that is undertaken in each of three levels or categories described in this report. The typology used was to construct three categories, which although not completely mutually exclusive, do delineate different approaches within this domain of work. These three categories are:

- Legislative approaches to promoting physical activity (mandatory)
- Regulatory and policy approaches (may be legislated, but are not mandatory)
- Environmental change approaches that promote the physical environment, built environment or physical infrastructure relevant to physical activity.

Defining the evidence in this arena is complicated. Although some legislation might be hypothetical and not been enacted yet, it is still possible to estimate potential benefits on population levels of physical activity. Other legislation or regulation/policy may be enacted, but its impact not evaluated. Finally, environmental changes are more frequent, but seldom evaluated to assess their impact on physical activity, although a burgeoning literature in this area exists in recent years in the scientific peer reviewed literature.

The specific Search strategy [in Web of Science, Medline, PubMed citation and reference databases] was to identify papers with title words or keywords ('Law*' or regulatory' and cross meshed with 'physical activity'); 384 abstracts were identified and perused, and over 50 papers retrieved and reviewed. In addition, this was supplemented by grey literature and reports identified using personal reference lists, personal files and through physical activity networks contacted (NSW PCAL; AusPANet; GlobalPANet). For the physical environment, a recent review of reviews was undertaken, where >10 reviews, and 400 papers in this area were appraised (Bauman 2012, Lancet physical activity series, paper #2); in addition, a recent summary review of physical activity and the built environment among children and adolescents was used (Ding 2011).

Analysis of research evidence on legislative or regulatory interventions to encourage active living

This is a different section to others in this report. Unlike worksites, active travel or even regulatory approaches to nutrition, there is limited evidence on what actually works at the macro level [national or state], or the intermediate level of local government. Much is written regarding the potential in this area for promoting physical activity, or around reviews of the potential for legislation or regulation, but limited actual evaluation evidence exists, either in the 'grey' literature or in the published scientific literature.

Past assessments

An early example of a true legislative approach was the Australian National Fitness Act in 1941 (Collins 2011). This was an early effort at the national level in Australia to provide a legislative framework surrounding the promotion of physical activity and physical fitness. The National Fitness Act provided direct funding for resources at the state level through national fitness councils as well as for developing infrastructure at the local level. This local level infrastructure, funding through municipalities and local government, focused particularly on children's physical activity and fitness, and included the construction of playgrounds, the development of sporting organisations for young people, and the development of youth clubs for teenagers. This was remarkable for its time, but was not linked to or seen as a public health strategy directly, as public health at that time focused almost exclusively on health protection and communicable disease control. Adult oriented physical activity policy took some years to develop, but was possibly stimulated through the Fitness Australia campaign launched in 1967 by the then Prime Minister Harold Holt. The act was repealed in 1970s, but its legacy regarding providing physical activity relevant legislation at multiple levels remains of current interest.

A review of physical activity-relevant legislation² was conducted for the NSW Premiers Taskforce on Physical Activity in 1997. This Taskforce commissioned this review to provide an outline of legislation in NSW that might be directly relevant to physical activity. The remit included all legislation, as part of the Taskforce's remit to consider strategies and leverage points outside of the health sector. The report did not provide examples where legislation had been specifically enacted to promote physical activity, but simply identified a legislative framework with PA relevant potential. This framework identified legislation that might directly or indirectly have the capacity to support physical activity and to support physical activity promoting environments. In particular, the report identified legislation relevant to air quality, crime prevention, urban design and sustainable transport networks. These were all relevant to the development of infrastructure or creation of safe environments in which people could be more physically active.

This review was the earliest of its kind internationally, and was carried out by a legal consulting company for the NSW Physical Activity Taskforce. It defined an inter-sectoral agenda for legislation relevant to physical activity, rather than actually indicating how those partnerships could be enacted. The relevant legislation in particular included the Clean Air Act, the Environmental Planning and Assessment Act, the Roads Act, the Passenger Transport Act, the Local Government Act and the Environmental Protection Act. These pieces of legislation were relevant to incidental physical activity, particularly walking and cycling, active transport and providing places and opportunities for people to play and be physically active. With respect to community safety the NSW Crimes Act the Police Service Act and the Local Government Act were also reviewed. As well as State legislation, some national level laws were reviewed. The Federal Health Act and Public Health Acts were also considered relevant. The key strategic implications of this report for the Taskforce were to communicate across sectors, to understand the need for legislation from a multiple portfolio perspective, and to use the NSW Physical Activity Taskforce as a central repository of information and communication body across agencies.

Review of legislation, policy approaches to physical activity

A systematic literature review was undertaken to identify papers in the area of physical activity, legislation, regulation and policy.³ The primary search strategy is shown in Appendix 1. This

² Note that no extant hard or soft copies exist of this report in NSW Health, nor in the successor organisation to the NSW PA Taskforce, the current NSW Council for Active Living; since the report was commissioned by the author of this Sax review report, it is available on request as a pdf file, lead author Ellis N 1997.

³ Most of the reviews of the physical environment are described later in Table 2.

extended previous reviews (Bellew 2011), and identified more than 50 relevant studies which were retrieved and examined. A summary of key studies is shown in table 2.4.3, with the highlights described. Note that few described intervention evidence, and most of the legislative papers described potential legal regulation, rather than actual interventions. Of the policy papers, some described implementation, but few indicated that actual evaluation was carried out.

In the health law literature, most of the discourse is around action on nutrition, rather than physical activity (in a systematic review of this area from a legal perspective, JLME 2009 bibliography). All recognise the role of laws in chronic disease prevention, and appreciate a public health approach, where individual behaviour change programs alone cannot fully address the determinants of obesity and inactivity (Swinburn 2008), and that upstream interventions are required for making public health change (Graff 2012). Use of laws is one way to influence the determinants of physical activity, and to support an integrated set of prevention programs (Magnusson 2008). This requires partnerships outside the health sector, and can be facilitated by implementing broader policies, regulation, and legal approaches in some sectors. This is a new area of work, and needs to increase awareness and skills of policy approaches in public health (Feleischhakes 2009) as legal approaches are still nascent (Gostin 2009).

There is a hierarchy of potential laws and legal processes that might address aspect relevant to physical activity, at Federal, State, and Local government levels (Mermin 2009). Legislation/policies need to be feasible, affordable, equity focused and able to be implemented (policy) and enforced (legislation) with political support to maintain them (Graff 2012, Kouzoukas 2009). Some commentators distinguish between regulation and mandatory enforceable legislation (Mermin 2009), a framework similar to the one used in Table 1. Overall, these are often conceptual papers, and regulatory 'inaction' is the norm (Vogel 2010).

Table 5 shows a set of published and grey literature papers relevant to physical activity and legislation, regulation and policy. Some are specifically focused on enacted legislation, such as the Taxation credit for fitness equipment in Canada (Ries 2010); this was enacted, but not evaluated, and its impact on population levels of physical activity among children was not assessed. Furthermore, it may have widened inequalities, with disadvantaged families less able to participate in the scheme. There has been a range of US legislation relevant to physical activity (Gostin 2009) – these included personal health Acts (NCPA 2012), 'no child left behind' for physical education in schools, transportation bills (active travel; and local government zoning and building ordinances) (Aytur 2008, Must 2009, Perdue 2005, Ashe 2009, Librett 2003). These have been examined in Europe as well (Goldbrandsson 2004, Nethe 2011, NICE 2008). A specific focus on school related policy has pervaded the literature (NICE 2008, Eyler 2012), with specific policies around physical education, active after school programs, travel to school programs, and in-school curriculum and activity time policies. Very little evidence at the population-level has been reported, with most trials reporting small scale research results from individual schools. Similarly, promotion of transport related interventions have been reported from European cities, with physical activity showing associations with urban form and transport zoning and public transportation systems, but again, generalisable lessons are limited for effects on population level physical activity.

The area of the physical and built environment is better evidence based, with reviews of the evidence and recommendations for physical activity promotion shown in Table 6. The US CDC Guide to preventive actions recommends community scale urban design, increasing places for people to be active, street-scale interventions, and stair use studies as 'recommended' (CDC Guide 2010). These are summarised in Table 2, but are based on many cross sectional studies. The few intervention studies, where an evaluation is carried out on a natural experiment or planned environmental change, show mixed results (McCormack 2011). Examples of increased physical activity is observed in response to building new trails and paths or bike lanes, and in response to playground construction (recent examples, Gustat 2012, Fitzhugh 2010), but these do not point to increased population-level physical activity participation, merely to increased usage. The need

for better evaluation of policy relevant initiatives, or environmental changes, using opportunistic research designs, in partnership and in a timely manner with policymakers, is warranted to generate better quality evidence in this area (McCormack 2011, Bauman 2012, Ding 2011).

Promoting stair use, although well evidenced in research studies, has shown almost no translation to testing this in community settings; this could be a way of increasing incidental physical activity across the population, but currently is not tested anywhere in the world in wider community locations. This is a low cost intervention with potential, but up-scaling is the key current challenge or limitation.

School strategies appear well evidence based, and are encouraged in overall global approaches to promoting physical activity (Khan 2012). The problem appears to be wide scale differences in implementation and enforcement, and divergence from the ideal integrated approach – which includes physical education (PE) policies, but also includes after school time, and travel to school.

The summary of findings in this area is shown in the table below, which distils the evidence from this review in summary recommendations format.

Legislative or regulatory interventions and environmental change to increase physical activity and active living



Table 5
Legislation/Regulation

Recommended actions	Evidence	Level of promise	Commentary/Rationale	Considerations
Specific legislation enacted around school Physical Education	Good evidence for enactment Limited monitoring of implementation	promising	If enacted legislation was enforced, would impact on PE and on PA levels in school age children	Enforcement difficult, across state and local jurisdictions ; good evidence that PE and sport do not adversely influence academic performance
Policy document, national/ regional PA plans	Indirect evidence from Europe	promising	Regions or nations that have specific PA plans tend to support, resource active living better	Need for functioning, shared agendas through effective inter-sectoral [cross Government] partnerships
Champions to support legislation	Limited evidence	some promise	May be short lived, once support person moves to other areas	Typically, can be a keen politician, high profile community member, or sportsperson/ celebrity
Municipal policies around active travel, park usage	Some evidence	some promise	Issues around congestion taxes, parking fees, availability of recreation space all shown to increase active living	Different approached needed for different legislation/regulations
Municipal policies around urban planning, land use, and public transport provision	Medium to high evidence, but mostly cross sectional research	some promise	Linked to active travel to work, and to active living in neighbourhoods ; implementation and population reach remain problematic	More likely to reach those least in need of physical activity strategies
Tax credits for fitness and equipment	Enacted in Canadian provinces	some promise	Effects on population not known	Possibility to widen inequalities exists



Table 6
Environmental change interventions

Recommended actions	Evidence	Level of promise	Commentary/Rationale	Considerations
Changes to the school environment	Policy [e.g. PE policies as above] and environment changes to school, comprehensive approaches – good evidence	promising	Costly to introduce multiple suite of interventions to the school setting, including school time, after school programs and travel to and from school	Would be beneficial in increasing physical activity in school age children and adolescents
Improving places to play and be active [children]	Good evidence	promising	Includes park and recreation space development, community youth sport promotion	Needs inter-agency collaboration and planned development program for environments and for non-elite sports programs
Changes to the urban environment [see regulation above] for adults	Medium evidence, but mostly cross sectional research designs	some promise	Has additional non health benefits on social capital, sense of community, possibly crime reduction	Walkability, higher residential density, footpaths, active travel options all associated with active living, but need better causal evidence, not from cross-sectional studies alone
Changes to the urban environment [see regulation above] for children	Medium evidence	some promise	Different to correlates of the built environment and PA in adults	Local factors, walkability, access to parks, recreation facilities, distance to schools all associated with active living
Promoting stair use through signage and facilitating access to stairs instead of elevators	Good research evidence, repeated numerous studies but in selected settings	some promise	Rarely disseminated or tested outside of the research settings [typically Universities or hospitals]	Lack of generalisability; not introduced into shopping malls, office buildings wide-scale, so population effects unknown

Recommendations

Healthy eating

The ACT government must act to ensure that the local food and nutrition environment is one that:

- Provides better access/exposure to healthy food and beverage options than to unhealthy options for all the community
- Reduces disparities in access to healthy foods and beverages
- Provides a balance of food outlets and avoids high levels of ready prepared food outlets in one location
- Reduces the economic or availability disincentives to choose healthy food and beverage options
- Encourages and supports local food production
- That encourages and supports healthy food and beverage options within ready prepared food outlets
- Where government agencies provide leadership and demonstrate health eating principles through the food and beverages available within their facilities
- Where the public are adequately informed to allow appropriate decisions around food and beverage selection before they purchase
- Where inappropriate marketing of EDNP foods around schools and areas where children congregate and at point of purchase is limited.

To achieve these objectives the ACT Government should consider the following options:

1. The development of mandatory nutrition standards for foods and beverages available in government-run or regulated services, programs and facilities including child care, preschool, schools and after-school care as well as government run recreation centres and venues
2. They should also ensure that local government agencies that operate cafeterias and vending options have strong nutrition standards in place wherever foods and beverages are sold or available
3. Institute or expand a program of point of purchase food or menu labelling including fast food outlets and supermarkets
4. Develop an ACT food and nutrition plan which addresses the local production, distribution, marketing, processing and sale of food and beverages within the ACT

Such a plan would consider in a coherent manner the regulatory, planning and policy options of the government to influence:

- The planning and siting of supermarkets and food outlets
- The variety and density of food outlets
- The food and beverages stocked by these outlets
- The potential for small mobile fruit and vegetable outlets
- Improved opportunities for local fruit and vegetable growers to market their products
- The use of community space to produce fruit and vegetables
- The provision of free/cheap fruit and vegetables within schools and day care through cooperative programs with local producers and vendors

5. Work with local food vendors to improve the quality and availability of healthy food and beverage options which are sold in an appropriate portion size
6. Improve the availability, access and quality of free drinking water in public places and schools
7. Mandate the availability of drinking water in all businesses and venues selling or providing food.

Physical activity

The ACT government can influence a range of regulatory, structural and environmental processes that can assist rather than discourage ACT residents from engaging in more physical activity and less sedentary behaviour. The key objectives of such action include:

- Encourage and promote routine physical activity with an emphasis on walking and cycling, both for recreation and transport purposes
- Increasing the availability, access to and safety of places where people can be physically active
- Developing policies that build physical activity into our daily lives
- Incorporating active design principles into building codes, housing strategies, and neighbourhood planning
- Ensuring appropriate levels of physical activity are achieved and long periods of physical inactivity discouraged in schools, workplaces and other institutions controlled by the ACT government.

To achieve these objectives the ACT Government should consider the following options many of which reinforce or directly intersect with recommended actions to improve active transport and are in line with recommendations from other public health agencies:

1. Integrate and prioritise recreational cycling and pedestrian needs into the transport master plan
2. Ensure that all new and renewal planning development projects include:
 - a network of sidewalks and street crossings that creates a safe and comfortable walking environment and that connects to schools, parks, and other destinations
 - streetscapes within residential areas to reduce vehicle speeds, accommodate bicyclists, and improve the walking environment
3. Plan, build, and maintain a network of trails and paths for pedestrians and bicyclists that are separated from traffic but well connected to transport and other community facilities
4. Build and maintain parks and playgrounds that are safe and attractive for playing, and in close proximity to residential areas. Improve park security through co-ordinated community policing or other security measures
5. Support and encourage the establishment of affordable after-school and weekend activity programs that provide recreational, sporting or supervised play opportunities. It may be necessary to consider regulatory and legislative options to address liability issues that might block implementation
6. Define regulations that mandate minimum play space, physical equipment, and duration of play in preschool, after-school, and child care programs. Regulations should also be developed to limit screen time in preschool and after-school programs

7. Develop worksite policies and practices that build physical activity into routines (for example, exercise breaks at a certain time of day and in meetings or walking meetings)
8. Improve stairway access and appeal, and promote their use especially in places frequented by younger persons.

References

1. Alaimo K, Packnett E, Miles RA et al. Fruit and vegetable intake among urban community gardeners. *J Nutr Educ Behav* 2008;40(2):94–101.
2. Anderson JV, Bybee DI, Brown RM et al. 5 a day fruit and vegetable intervention improves consumption in a low income population. *J Am Diet Assoc* 2001;101(2):195–202.
3. Ashe M, Bennett G, Economos C et al. Assessing coordination of legal-based efforts across jurisdictions and sectors for obesity prevention and control. *J Law Med Ethics* 2009;37(Suppl1):45–54.
4. Ashe M, Jernigan D, Kline R et al. Land use planning and the control of alcohol, tobacco, firearms, and fast food restaurants. *Am J Public Health* 2003;93(9):1404–1408.
5. Ayala GX, Baquero B, Linnan L et al. Working with tiendas to promote healthy eating. Presentation at the IOM/NRC workshop on the public health effects of food deserts. Washington DC; January 27, 2009.
6. Aytur SA, Rodriguez DA, Evenson KR et al. Urban containment policies and physical activity. A time-series analysis of metropolitan areas, 1990–2002. *Am J Prev Med* 2008;34(4):320–332.
7. Ball K, Mishra GD, Thane CWS et al. How well do Australian women comply with dietary guidelines? *Public Health Nutr* 2004;7(3):443–452.
8. Bauman AE, Reis RS, Sallis JF et al. Correlates of physical activity: why are some people physically active and others not? *Lancet* 2012;380(9838):258–271.
9. Bellew B, Bauman A, Martin B et al. Public policy actions needed to promote physical activity. *Current Cardiovascular Risk Reports* 2011;5(4):340–349.
10. Bleich SN, Herring BJ, Flagg DD et al. Reduction in purchases of sugar-sweetened beverages among low-income Black adolescents after exposure to caloric information. *Am J Public Health* 2012;102(2):329–335.
11. Boylan S, Louie JC, Gill TP. Consumer response to healthy eating, physical activity and weight-related recommendations: a systematic review. *Obes Rev* 2012;13(7):606–617.
12. British Retail Consortium. British Retailing: A Commitment to Health. BRC [Internet] 2009 [cited 12 December 2012]. Available from: www.brc.org.uk/ePublications/A_Commitment_to_Health/index.html
13. Bromley RDF, Thomas CJ. The retail revolution, the carless shopper and disadvantage. *Transactions of the Institute of British Geographers* 1993;18(2):222–236.
14. Bruemmer B, Krieger J, Saelens BE et al. Energy, saturated fat, and sodium were lower in entrées at chain restaurants at 18 months compared with 6 months following the implementation of mandatory menu labeling regulation in King County, Washington. *J Acad Nutr Diet* 2012;112(8):1169–1176.
15. Butland B, Jebb S, Kopelman P et al. Tackling Obesities: Future Choices – Project Report (2nd edition). London: Government Office for Science, 2007.
16. Cairns G, Angus K, Hastings G. The extent, nature and effects of food promotion to children: a review of the evidence to December 2008. Geneva: World Health Organization; 2009.
17. National Collaborating Centre for Primary Care and the Centre for Public Health Exchange at NICE. Obesity: guidance on the prevention, identification, assessment and management of overweight

- and obesity in adults and children. NICE clinical guideline 43. London: National Institute for Health and Clinical Excellence, 2012.
18. Centers for Disease Control (CDC). Environmental and Policy Approaches to Increase Physical Activity: Point-of-Decision Prompts to Encourage Use of Stairs. [Internet] 2010 [cited December 2012]. Available from: www.thecommunityguide.org/pa/environmental-policy/podp.html and Task Force on Community Preventive Services. Recommendation for use of point-of-decision prompts to increase stair use in communities. *Am J Prev Med* 2010;38(2S):290–291.
 19. Cincirpini P. Changing food selections in a public cafeteria: an applied behavioural analysis. *Behav Modif* 1984;8:520–539.
 20. City of Greater Geelong. 2009–2013 Geelong Health and Wellbeing Plan; A collaborative approach – the way forward. City of Greater Geelong. [Internet] 2009. Available from: www.geelongaustralia.com.au/community/health/documents/item/8cc89d5225acc58.aspx
 21. Clarke G, Eyre H, Guy C. Deriving indicators of access to food retail provision in British cities: studies of Cardiff, Leeds and Bradford. *Urban Studies* 2002;39:2041–2060.
 22. Clegg S, Jordan E, Slade Z for BMRB Social Research. An evaluation of the provision of calorie information by catering outlets. London: Food Standards Agency, 2009.
 23. Collins JA, Lekkas P. Fit for purpose: Australia's National Fitness Campaign. *Med J Aust*. 2011;195(11–12):714–716.
 24. Cummins S, Petticrew M, Higgins C et al. Large scale food retailing as an intervention for diet and health: quasi-experimental evaluation of a natural experiment. *J Epidemiol Community Health* 2005;59(12):1035–1040.
 25. Department of Racing Gaming and Liquor. Provision of free drinking water [Internet] 2009. Available from: www.rgl.wa.gov.au/ResourceFiles/Policies/Drinking_Water.pdf
 26. Dick M, Lee A, Bright M et al. Evaluation of implementation of a healthy food and drink supply strategy throughout the whole school environment in Queensland state schools, Australia. *Eur J Clin Nutr* 2012;66(10):1124–1129.
 27. Ding D, Sallis JF, Kerr J et al. Neighborhood environment and physical activity among youth: a review. *Am J Prev Med* 2011;41:442–455.
 28. Donkin AJ, Dowler EA, Stevenson SJ et al. Mapping access to food in a deprived area: the development of price and availability indices. *Public Health Nutr* 2000;3(1):31–38.
 29. Dumanovsky T, Huang CY, Bassett MT et al. Consumer awareness of fast-food calorie information in New York City after implementation of a menu labelling regulation. *Am J Public Health* 2010;100(12):2520–2525.
 30. Elbel B, Kersh R, Brescoll VL, Dixon LB. Calorie labelling and food choices: a first look at the effects on low-income people in New York City. *Health Affairs (Millwood)* 2009; doi:10.1377/hlthaff.28.6.w1110
 31. Ellis N and Associated. Legislation and Physical activity—a report for NSW Health, NSW Premier's taskforce on physical activity, 12th May 1997. Sydney: Centre for Health Advancement. NSW Department of Health, 1997.
 32. Eyler AA, Swaller EM. An analysis of community use policies in Missouri school districts. *J Sch Health* 2012;82(4):175–179.
 33. Fear T, Gibbons C, Anderson S. The Heart Foundation's 'Tick' Program. Driving innovation for a healthier food supply. *Food Australia* 2004;56(12):599–600.
 34. Fitzhugh EC, Bassett DR Jr, Evans MF. Urban trails and physical activity: a natural experiment. *Am J Prev Med*. 2010;39(3):259–262.
 35. Fleischhacker S, Ammerman A, Perdue WC et al. Improving legal competencies for obesity prevention and control. *J Law Med Ethics* 2009;37(Suppl1):76–89.

36. Gittelsohn, J. Overview of efforts to change the food environment. Presentation at the IOM/NRC workshop on the public health effects of food deserts. Washington DC; January 27, 2009.
37. Gittelsohn J, Song H-J, Suratkar S et al. An urban food store intervention positively affects food-related psychosocial variables and food behaviours. *Health Educ Behav* 2010;37(3):390–402.
38. Gostin LO, Pomeranz JL, Jacobson PD et al. Assessing laws and legal authorities for obesity prevention and control. *J Law Med Ethics* 2009;37(Suppl1):28–36.
39. Graff SK, Kappagoda M, Wooten HM et al. Policies for healthier communities: historical, legal, and practical elements of the obesity prevention movement. *Annu Rev Public Health* 2012;33:307–324.
40. Guldbrandsson K, Wennerstad KM, Rasmussen F. Municipal policies and plans of action aiming to promote physical activity and healthy eating habits among schoolchildren in Stockholm, Sweden: a cross-sectional study. *Implement Sc* 2009;4:47.
41. Gustat J, Rice J, Parker KM et al. Effect of changes to the neighborhood built environment on physical activity in a low-income African American neighborhood. *Prev Chronic Dis.* 2012;9:E57.
42. Guy CM, Clarke G, Eyre H. Food retail change and the growth of food deserts: a case study of Cardiff. *International Journal of Retail and Distribution Management* 2004;32(2):72–88.
43. Guy CM, David G. Measuring physical access to ‘healthy foods’ in areas of social deprivation: a case study in Cardiff. *Int J Consum Stud* 2004;28(3):222–234.
44. Harnack LJ, French SA. Effect of point-of-purchase calorie labelling on restaurant and cafeteria food choices: A review of the literature. *Int J Behav Nutr Phys Act* 2008;5:51–56.
45. Hastings G, Stead M, McDermott L, Forsyth A, MacKintosh AM, Rayner M, Godfrey C, Caraher M, Angus K Review of research on the effects of food promotion to children. Glasgow: University of Strathclyde, Centre for Social Marketing, 2003.
46. Healthlinks. Take Five! Evaluation report: phase 2 - April 2002–March 2003. UK: Healthlinks, 2003.
47. Herman DR, Harrison GG, Afifi AA et al. Effect of a targeted subsidy on intake of fruits and vegetables among low-income women in the Special Supplemental Nutrition Program for Women, Infants, and Children. *Am J Public Health* 2008;98(1):98–105.
48. Holdsworth M, Raymond NT, Haslam C. Does the Heartbeat Award scheme in England result in change in dietary behaviour in the workplace? *Health Promot Int* 2004;19(2):197–204.
49. Howard C. Government Intervention – pp 13 in Special Report on Obesity. *The Economist*, December 15, 2012.
50. Institute of Medicine (IOM). Food marketing to children and youth: threat or opportunity? Washington DC: Food and Nutrition Board, Board on Children, Youth and Families. Institute of Medicine of the National Academies, 2006.
51. IOM (Institute of Medicine). Local Government Actions to Prevent Childhood Obesity. Washington, DC: The National Academies Press, 2009.
52. Jeffery RW, French SA, Raether C et al. An environmental intervention to increase fruit and salad purchases in a cafeteria. *Prev Med* 1994;23(6):788–792.
53. Kahn LK, Sobush K, Keener D et al. Recommended community strategies and measurements to prevent obesity in the United States. *CDC Morbidity and Mortality Weekly Report* 2009;58(No. RR-7):1–29.
54. Kelly B, Cretikos M, Rogers K et al. The commercial food landscape: outdoor food advertising around primary schools in Australia. *Aust N Z J Public Health* 2008;32(6):522–528.
55. Kouzoukas DL. Legal preparedness for obesity prevention and control: the structural framework and the role of government. *J Law Med Ethics* 2009;37(Suppl1):24–27.
56. Kuo T, Jarosz CJ, Simon P et al. Menu labelling as a potential strategy for combating the obesity epidemic: a health impact assessment. *Am J Public Health* 2009;99(9):1680–1686.

57. Lang JE, Mercer N, Tran D et al. Use of a supermarket shelf-labelling program to educate a predominately minority community about foods that promote heart health. *J Am Diet Assoc* 2000;100(7):804–809.
58. Lang T, Caraher M. Access to healthy foods: part II. Food poverty and shopping deserts: what are the implications for health promotion policy and practice? *Health Education Journal* 1998;57:202211.
59. Larson NI, Story MT, Nelson MC. Neighbourhood environments: disparities in access to healthy foods in the U.S. *Am J Prev Med* 2009;36(1):74–81.
60. Lawrence O, Gostin JD. Law as a tool to facilitate healthier lifestyles and prevent obesity. *JAMA* 2007;297(1):87–90.
61. Lee V, Mikkelsen L, Srikantharajah J et al. Promising Strategies for Creating Healthy Eating and Active Living Environments. San Francisco: Healthy Eating Active Living Convergence Partnership, 2008.
62. Libman K, Freudenberg N, O’Keefe E. A Tale of Two ObesCities: Comparing responses to childhood obesity in London and New York City. New York and London: City University of New York and London Metropolitan University Childhood Obesity Collaborative, January 2010.
63. Librett JJ, Yore MM, Schmid TL et al. Local ordinances that promote physical activity: a survey of municipal policies. *Am J Public Health* 2003;93(9):1399–1403.
64. Loewenstein GDA et al. Can behavioural economics make us healthier? *BMJ* 2012;344:e3482.
65. Ludwig DS, Peterson KE, Gortmaker SL. Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis. *Lancet* 2001;357(9255):505–508.
66. MacKay S. Legislative solutions to unhealthy eating and obesity in Australia. *Public Health* 2011;125(12):896–904.
67. Magnusson RS, Colagiuri R. The law and chronic disease prevention: possibilities and politics. *Med J Aust* 2008;188(2):104–105.
68. McCormack GR, Shiell A. In search of causality: a systematic review of the relationship between the built environment and physical activity among adults. *Int J Behav Nutr Phys Act* 2011;8:125.
69. McCormack LA, Laska MN, Larson NI et al. Review of the nutritional implications of farmers' markets and community gardens: a call for evaluation and research efforts. *J Am Diet Assoc* 2010;110(3):399–408.
70. Mensink F, Schwinghammer SA, Smeets A. The Healthy School Canteen Programme: a promising intervention to make the school food environment healthier. *J Environ Public Health* 2012;2012:41576
71. Mermin SE, Graff SK. A legal primer for the obesity prevention movement. *Am J Public Health* 2009;99(10):1799–1805.
72. Michimi A, Wimberly MC. Associations of supermarket accessibility with obesity and fruit and vegetable consumption in the conterminous United States. *Int J Health Geogr.* 2010;9:49.
73. Mooney C. Cost and availability of healthy food choices in a London health district. *J Hum Nutr Diet* 1990;3(2):111–120.
74. National Preventative Health Taskforce (NPHT). Australia: the healthiest country by 2020. National preventative health strategy – the roadmap for action. Canberra: Commonwealth of Australia, 2009.
75. Nethe A, Dorgelo A et al. Existing policies, regulation, legislation and ongoing health promotion activities related to physical activity and nutrition in pre-primary education settings: an overview. *Obes Rev* 2012;13(Suppl1):118–128.

76. New South Wales Government. Liquor Regulation 2008—Part 5 Division 2 Clause 51 Drinking water to be available free of charge where liquor served. NSW legislation [Internet] 2008. Available from: www.legislation.nsw.gov.au/maintop/search/inforce
77. New York City Obesity Task Force. Reversing the Epidemic: The Plan to Prevent and Control Obesity. NYC; May 31, 2012.
78. National Institute for Health and Clinical Excellence. Physical activity and the environment (PH8). NICE public health guidance 8. [Internet] 2008 [cited December 2012]. Available from: www.nice.org.uk/ph008
79. NSW Health Nutrition and Physical Activity Branch. NSW Healthy School Canteen Strategy Evaluation Report 2005. Sydney: NSW Department of Health, 2006.
80. NSW Health. Live Life Well @Health: healthier food & drink choices – staff and visitors in NSW Health facilities. Document PD2009-081NSW Health, 2009.
81. Paquin S. Le zonage et la classification des usages de restauration et de commerces d'alimentation: une mesure d'urbanisme pour diminuer l'épidémie d'obésité? *Can J Urban Res* 2008;17(1):48–62.
82. Perdue WC, Richards EP, Acree KH. Legal frameworks for preventing chronic disease. *J Law Med Ethics* 2005;33(4 Suppl):94–97.
83. Pothukuchi K. Attracting supermarkets to inner-city neighbourhoods: economic development outside the box. *Economic Development Quarterly* 2005;19(3):232–244.
84. Public Health Agency of Canada. Obesity in Canada: a joint report from the Public Health Agency of Canada and the Canadian Institute for Health Information. Her Majesty the Queen in Right of Canada, 2011.
85. Queensland Health. A Better Choice – Healthy Food and Drink Supply Strategy for Queensland Health Facilities. Brisbane: The State of Queensland (Queensland Health), 2007.
86. Queensland Government. A Better Choice. Catering Guidelines for Meetings and Functions. Brisbane: The State of Queensland (Queensland Health); 2007.
87. Queensland Health. A Better Choice—Healthy Food and Drink Supply Strategy for Queensland Health Facilities: Evaluation Report. Brisbane: Queensland Health; 2010 [Internet]. Available from: www.health.qld.gov.au/health_professionals/food/abetterchoice.asp
88. Ries NM, von Tigerstrom B. Roadblocks to laws for healthy eating and activity. *CMAJ* 2010;182(7):687–692.
89. Ries NM, Rachul C, Caulfield T. Newspaper reporting on legislative and policy interventions to address obesity: United States, Canada, and the United Kingdom. *J Public Health Policy* 2011;32(1):73–90.
90. Roberto CA, Schwartz MB, Brownell KD. Rationale and evidence for menu-labeling legislation. *Am J Prev Med* 2009;37(6):546–551.
91. Healthy Eating Research. Menu labelling: does providing nutrition information at the point of purchase affect consumer behaviour? A research synthesis, June 2009. Princeton NJ: Robert Wood Johns Foundation (RWJF), 2009.
92. Robinson N, Caraher M, Lang T. Access to shops: the views of low-income shoppers. *Health Educ J* 2000;59(2):121–136.
93. Robinson-O'Brien R, Story M, Heim S. Impact of garden-based youth nutrition intervention programs: a review. *J Am Diet Assoc* 2009;109(2):273–280.
94. Sahud HB, Binns HJ, Meadow WL et al. Marketing fast food: impact of fast food restaurants in children's hospitals. *Pediatrics* 2006; 118(6):2290–2297.
95. San Diego County. Call to Action: San Diego County Childhood Obesity Action Plan, 2010.
96. Shepherd R, Paisley CM, Sparks P et al. Constraints on dietary choice: the role of income. *Nutrition and Food Science* 1996;96(5):19–21.

97. Sutherland LA, Kaley LA, Fischer L. Guiding Stars: the effect of a nutrition navigation program on consumer purchases at the supermarket. *Am J Clin Nutr* 2010;91(4):1090S–1094S.
98. Swinburn BA. Obesity prevention: the role of policies, laws and regulations. *Aust New Zealand Health Policy* 2008;5:12.
99. Taylor RW, McAuley KA, Barbezat W et al. APPLE Project: 2-y findings of a community-based obesity prevention program in primary school-age children. *Am J Clin Nutr* 2007;86(3):735–742.
100. Texas Department of State Health Services. Updates for the Strategic Plan for the Prevention of Obesity in Texas. Tracking progress, refining targets, and evaluating implementation. Texas State Dept of Health, 2008.
101. The Scottish Government. Preventing overweight and obesity in Scotland: a route map towards healthy weight. Edinburgh: Scottish Government, 2010.
102. TravelSmart. Evaluation of TravelSmart Western Australia. Government of Western Australia. [Internet] 2011 [cited December 2012]. Available from: www.beactive.wa.gov.au/index.php?id=1433
103. Food Standards Agency. UK Salt reduction initiatives. London: Food Standards Agency. [Internet] 2009 [cited October 2010]. Available at <http://www.food.gov.uk/multimedia/pdfs/saltreductioninitiatives.pdf>
104. Vartanian LR, Schwart MB, Brownell KD. Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis. *Am J Public Health* 2007;97(4):667–675.
105. Vogel L. Public health and nutrition advocates fear regulatory inaction has become the norm. *CMAJ* 2010;182(10):E465–E466.
106. Vyth EL, Steenhuis IHM, Roodenburg AJC et al. Front-of-pack nutrition label stimulates healthier product development: a quantitative analysis. *Int J Behav Nutr Phys Act* 2010;7:65.
107. Wang YC, Ludwig DS, Sonnevill K et al. Impact of change in sweetened caloric beverage consumption on energy intake among children and adolescents. *Arch Pediatr Adolesc Med* 2009;163(4):336–343.
108. White M, Bunting J, Raybould S et al. Do food deserts exist? A multi-level, geographical analysis of the relationship between retail food access, socio-economic position and dietary intake. Final Report to the Food Standards Agency, UK. Newcastle upon Tyne: Newcastle University, 2004.
109. World Cancer Research Fund (WCRF). Policy and action for cancer prevention. Food, nutrition, and physical activity: a global perspective. Washington DC: American Institute for Cancer Research (AICR), World Cancer Research Fund (WCRF), 2009.
110. Wrigley N, Warm D, Margetts B. Deprivation, diet, and retail-food access: findings from the Leeds 'Food Deserts' study. *Env & Plan A*. 2003;35:151–188.

3 Active transport interventions

Research question: What are the most effective interventions for Governments (at a Local, State and/or City level) to deliver active transport programs and infrastructure to increase the proportion of the ACT population walking, cycling and using public transport for travel?

- Interventions are broadly defined to include running a program, planning infrastructure (such as a new road or bicycle paths), new governance structures (e.g. City of Sydney Bicycle Unit)
- As measuring outcomes in this context is difficult, information on the type of measurement tools used and their suitability to the ACT context should be included
- Address the feasibility of using these interventions in an integrated manner with the existing ACT city-wide transport plan.

What are the most effective interventions for Governments (at a Local, State/City level) to deliver active transport programs and infrastructure to increase the proportion of the ACT population?

Identification of potential strategies

‘Active travel or transport’ refers to physical activity undertaken as a means of transport. This can include walking and cycling. It also refers to the use of public transport, as most public transport trips require a walk or cycle trip at either end. Recent research in New South Wales found that people who drove to work were 13% more likely to be overweight or obese than those who walked, cycled or used public transport, regardless of their income level. Additionally, the further people had to drive each day, the greater their weight increase (Wen et al. 2006). International comparisons of active transport and obesity rates yield similar findings (Basset et al. 2008).

Encouraging active forms of transport to and from school, including using public transport, is one way to increase physical activity and encourage the development of healthy commuting habits, which can be transferred into later life. To make cycling and walking more accessible, it is important that facilities for cyclists and pedestrians are further improved. Walking and cycling opportunities must be safe and serve as connections to facilities the community uses as part of daily life (e.g. schools, shops, and libraries).

A number of recent policy or position documents were reviewed for their recommendations based on their reviews of the evidence. Documents included were the 2012 NICE report, 2010 ACE report, 2012 BMA report (British Medical Association 2012), 2008 Cycling Promotion Fund report (Bauman et al. 2008), and the Victorian review (Krizek et al. 2007). In addition, systematic reviews of the literature (Ogilvy et al. 2007, Yang et al. 2010, Fraser and Lock 2010) and expert recommendations were also reviewed for their applicability (Pucher et al. 2010a, Pucher and Buehler 2008, Bauman et al. 2008).

Interventions were broadly defined, however, only those strategies that could be applied at a state/local government area were considered. This resulted in some potential strategies being excluded, for example tax incentives to businesses for employees riding to work.

Analysis of research evidence

Cycling and walking

Bauman and others produced a comprehensive review of the literature and report on promoting cycling for the city of Melbourne and recommended the following broad strategies (Bauman et al. 2008). Each of the recommendations is largely dependent upon one another and should be implemented in an integrated, coordinated way to increase bicycle participation:

- Mass marketing campaigns highlighting the benefits of cycling
- Bicycle education programs to increase skills, confidence and safety
- Behaviour change initiatives to market alternatives to car use
- Cycling events to provide incentives for people to ride in a supportive environment particularly for novice riders
- Urban planning/bicycle infrastructure/funding focused on increasing bicycle friendly design.

To achieve changes a strong investment in the promotion of cycling is required which combines social marketing with a wide range of structural measures including; wider speed restrictions in urban areas, investment in high quality segregated cycle facilities on major roads, and general land use and transport policies that 'advantage cycling' and reduce the convenience of the car (Jones, 2012). Strategies to increase population levels of cycling have been documented previously (Rissel and Garrard 2006) and include higher density and mixed use zoning policies to increase destinations of interest within shorter distances investment in cycling infrastructure such as bike paths and on-road bike lanes which are connected (Pucher et al. 2010b), and 'invisible infrastructure' such as traffic calming strategies which lower speed limits and close roads to through traffic to increase bicycle friendliness (Morrison et al. 2004).

Behavioural programs to encourage more cycling have also been effective. Cycling skills courses for children and adults (Telfer et al. 2006), ride-to-work programs (Rose and Marfut 2007) and public cycling events (Bowles et al. 2006) all encourage cycling. NICE recommends intensive sessions in particular settings or aimed at particular groups, such as: 'Bike to work' weeks and workplace challenges; activities aimed at children and families (such as 'Bike it', 'Bike club' and other school programs) (National Institute for Clinical Excellence 2012). A systematic review found that of sixteen studies assessing individualised marketing of 'environmentally friendly' modes of transport to interested households, all reported modest but consistent net effects equating to an average of eight additional cycling trips per person per year in the local population (Yang et al. 2010). End-of-trip facilities, such as showers, changing rooms and bicycle storage in workplaces make active transport to work more feasible (Bauman et al. 2008).

In the Yang et al. systematic review, six studies examined interventions aimed specifically at promoting cycling, of which four (an intensive individual intervention in obese women, high quality improvements to a cycle route network, and two multifaceted cycle promotion initiatives at town or city level) were found to be associated with increases in cycling (Yang et al. 2010).

Positive news stories and social marketing strategies which endorse and legitimate cycling are also necessary to create a positive social environment (Daley and Rissel, 2010, Bauman et al. 2008).

The environmental factors identified as being positively associated with cycling included presence of dedicated cycle routes or paths, separation of cycling from other traffic, high population density, short trip distance, proximity of a cycle path or green space and for children projects promoting 'safe routes to school'. Negative environmental factors were perceived and

objective traffic danger, long trip distance, steep inclines and distance from cycle paths. Of the seven studies which focused primarily on the impact of cycle routes reviewed by Fraser and Lock (2010), four demonstrated a statistically significant positive association (Fraser and Lock 2010).

Bicycle loan programs overcome a major barrier to cycling of not having access to a bicycle, (Miskell et al. 2010) and may have an impact in or close to urban core areas (Krizek 2007). The Barcelona bike share initiative is a policy measure that has been highly successful in terms of number of subscribers and led to a large increase in trips on bicycles, which is often hard to achieve. A previous study showed that interventions generally led to an average 3% increase in the prevalence of cycling in the population. 'Bicing' the scheme in Barcelona so far has increased the number of cycling trips by 30% (Rojas-Rueda et al. 2011).

Community or urban design including gross population density, street pattern, and accessible destinations are important in creating a walkable environment (Krizek 2007). A review of the impact of public transport on physical activity found that when objectively measured, users of public transport achieved between 8 and 32 minutes of additional physical activity per day compared with car users (Rissel et al. 2012).

Pricing factors are important for encouraging non-motorised travel. Auto and fuel taxation and parking are two factors that stand out. If motorised transportation is more expensive, people may well shift to non-motorised modes though they may also merely travel less or take transit.

Active travel and safe routes to school programs

The objective of these programs is to encourage and support active travel to school but the content of these programs varies slightly between settings. They usually contains an educational component with a focus on health and road safety, supervised walking to school programs (walking buses), cycling groups and even car-pooling. Variations of these programs are currently operating in many Australian states (including the ACT), the US, the UK and other European countries. They are usually administered by local government authorities. Although there is now a considerable body of information about these programs, evaluation usually focuses on a reduction in car usage but some trials have been able to demonstrate a small increase in physical activity (McMillan 2009). A frequently reported barrier to the establishment or maintenance of these programs is the cost of setting up the route and the need for ongoing input from volunteer adult supervisors.

Boys are more likely to participate in these programs than girls and participants tend to already be fitter than non-participants (McMillan 2009). Research in this area would benefit from more consistent methodology and content of programs.

'Safe routes to school' programs are a similar strategy to walking or cycling groups but focuses on physical changes to create safe and accessible routes to school by improving paths, creating safer crossings and slowing down traffic. This is a more appealing option for older children and may be more sustainable as it does not require direct adult supervision of trips to school. However, the initial evaluation of the Victorian walk to school program found that the engineering required to create safe routes to school is a considerable expense for local governments. Evaluations of such programs usually (but not always) show an increase in active travel to school as well as improvements in road safety behaviours.

Interventions to promote reduced use of cars (TravelSmart)

TravelSmart is a voluntary behaviour change program that encourages people to use sustainable travel modes such as public transport, walking, cycling and carpooling rather than single occupancy travel in a car. Its focus is more on environmental than health benefits. The TravelSmart Program operates in most Australian states and a similar program exists in the UK and the US. Implementation guides and protocols are available to support widespread implementation.

Although these programs have been evaluated in some depth, there has been no focus on health outcomes. An evaluation of the Perth program using repeat cross sectional community surveys indicated a significant reduction in car journeys and a shift to more active forms of travel (City of Perth 2008). A recent economic analysis found that although TravelSmart was unlikely to be cost-neutral, it was rated a cost effective intervention to improve physical activity (Vos et al. 2009). The program has the active support of governments because of the potential benefits on travel infrastructure loads and road building costs. They are generally low cost programs that have some potential to improve physical activity.

Workplace organisational travel plans

A travel plan is a package of measures produced by employers to encourage staff to use alternatives to single-occupancy car use. Such a plan could include: car sharing schemes; a commitment to improve cycling facilities; a dedicated bus service or restricted car parking allocations. It might also promote flexible working practices such as remote access and video conferencing. These programs share many of the attributes of TravelSmart and school-based programs.

Evaluation of these programs has focused on travel mode use and a Cochrane review of programs found that more than half reported a positive shift away from car use, but there were many problems and inconsistencies with the evaluations (Hosking et al. 2010). The best studies revealed significant improvements in walking, cycling and public transport use (Yang et al. 2010, Brockman and Fox 2011). Most of the reported programs were implemented in the US or UK. This form of intervention has been under-explored within Australia and is a natural extension of TravelSmart programs.

Purchase of annual travel passes through salary sacrifice or pay deductions has been shown to increase use of public transport (Lachapelle and Frank 2009, Ogilvie et al. 2007, Jones 2012). Currently there are potential tax breaks associated with purchase and use of motor vehicles in Australia but the Fringe Benefits Tax (a tax on the benefits wage earners are given by employers) regulations inhibit a similar financial incentive for active travel.

Provision of infrastructure cycle paths, footpaths and improved public transport

Appropriate levels of infrastructure are important to enable, support and encourage active travel. The connection between availability of such infrastructure and its use is frequently shown in qualitative assessments of public needs. Currently there is an imbalance in the infrastructure investment for car use and that for more active forms of travel.

The effects of infrastructure interventions are rarely evaluated effectively in terms of impact on physical activity with the most common outcome of any evaluation is frequency of use. One study evaluated the impact of using public transport to replace car use and found that it resulted in a small increase in walking and daily step counts (Wener and Evans 2007). A range of studies

from the US (Basset et al. 2008) Netherlands (Salaens et al. 2003) and one from Victoria (Fraser and Lock 2010) generally show that improved path networks, connectivity and separation from traffic resulted in significant improvements in use. A recent evaluation of the City of Sydney bike path initiative found a significant increase in cyclists and mode share building of new bike paths (Zander et al. 2012). Likewise, improvements to footpaths and development of dedicated trails to urban centres were associated with increased walking as a form of transport (Owen et al. 2004). There is significant evidence that improvements to public transport infrastructure result in increased patronage and reduced car use (Heath et al. 2006).

Traffic calming and safety measures

Traffic calming measures such as speed humps, traffic circles, and pedestrian refuges are utilised to slow traffic speeds and reduce flows providing greater opportunities for pedestrian and cycle traffic to mix with car traffic.

The motivation for instituting traffic calming measures is usually road safety so such programs are usually not assessed in terms of their impact on physical activity. However, traffic calming reduces pedestrian injuries and has been shown to have some positive impact on the rates of walking and cycling in the calmed area, especially in children with one study revealing 20% of participants indicating that they walked more (Morrison et al. 2004).

Interventions to increase and promote active travel



Table 7
Cycling

Recommended actions	Evidence	Level of promise	Commentary/Rationale	Considerations
Develop a comprehensive program of action to promote reduced use of cars (TravelSmart) and a shift to active travel	Observational, repeated cross-sectional surveys	very promising	TravelSmart is a voluntary behaviour change program that encourages people to use sustainable travel modes such as public transport, walking, cycling and carpooling rather than single occupancy travel in a car. An evaluation of the Perth TravelSmart program indicated a significant reduction in car journeys and a shift to more active forms of travel	<p>Rated a cost effective intervention to improve physical activity (Vos et al. 2010)</p> <p>Additional environmental benefits from reduced car use</p> <p>Reduced traffic load leads to less demand for expensive road infrastructure</p>
Develop a network of bicycle pathways segregated from car traffic	Observational	very promising	Segregation from cars, level of connectivity, proximity to employment areas and reliability and repair of active travel infrastructure, is important in influencing its use. Well recognised that beginners and less confident cyclists want separation from motor vehicle traffic. Significant increases in cyclists and mode share in the City of Sydney following building of new bike paths (Zander et al. 2012)	<p>Bicycle infrastructure is cheaper than roads but many see it as competition for resources and space.</p> <p>Must serve major employment areas and reach outer (poorer) residential areas</p> <p>Connectivity is important</p>
Institute workplace organisational travel plans in ACT government departments and encourage their uptake in private sector	Observational	promising	<p>A travel plan is a package of measures produced by employers to encourage staff to use alternatives to single-occupancy car use. Such a plan could include: car sharing schemes; a commitment to improve cycling facilities; a dedicated bus service or restricted car parking allocations</p> <p>These schemes result a positive shift away from car use The best studies revealed significant improvements in walking, cycling and public transport use (Yang et al. 2010, Brockman</p>	<p>These are under-utilised in the Australian context. May be feasible to start implementation with Government run facilities Equity considerations with small and large private sector businesses</p> <p>These programs share many of the attributes of TravelSmart and school-based programs.</p>

Recommended actions	Evidence	Level of promise	Commentary/Rationale	Considerations
			and Fox 2011).	
Develop and implement a public bicycle share scheme	Observational	promising	Bicycle share schemes are available in many cities throughout the world and encourage cycling for short journeys. In the right context, internationally bicycle share schemes have increased the population level of cycling	The issue of helmet use regulations needs to be addressed Important benefits to tourism as well
Training in cycling skills	Pre-post surveys	some promise	Improving the confidence and skills of adults and children to ride a bicycle will encourage greater use of this form of transport	Very useful for some, but ultimately will have limited reach in the community
Consider possible exemptions to bicycle helmet legislation	Observational	some promise	Some commentators see helmet legislation as a deterrent to more adults cycling, particularly for short trips There may be situations where adults could be exempted from wearing helmets for unplanned trips	Compulsory helmet wearing is seen as paternalistic by certain groups Strong support for helmet use by medical sector – especially trauma medicine
Establish a program of Cycling events (e.g. Sydney Spring Cycle, Bay in a Day, Ride to Work Day)	Non experimental cohort	some promise	Widespread community participation heightens attention on cycling, with beginners and non-regular cyclists preparing before the event and continuing afterwards	Reach may be limited. Such events may only appeal to committed cyclists
Establish a program of car-free events (cyclovía) or days	Observational	some promise	Recommended by NICE (National Institute for Clinical Excellence, 2012), and has worked well in some countries. Largely untested in Australia	Enforcement needs planning and resources. Events must be regular to ensure awareness



Table 8
Walking

Recommended actions	Evidence	Level of promise	Commentary/Rationale	Considerations
Ensure all ACT residents have access (within 800m) to frequent public transport services	Observational studies	very promising	Increased use of public transport leads to increased walking. The most consistent recommendation from transport planners to increase public transport use relates to frequency and access to services. In addition to improved services, the availability of public transport needs to be advertised.	Public transports services will not be cost neutral Poorer neighbourhoods often have poorer public transport services
Establish a program to develop safe routes to school for all ACT students	Observational	promising	Safe routes to school programs use a variety of education, engineering and enforcement strategies that help make routes safer for children to walk and bicycle to school; as well as encouragement strategies to entice more children to walk and bike. The engineering component of these programs focuses on physical changes to create safe and accessible routes to school by improving paths, creating safer crossings and slowing down traffic	The initial engineering work on footpaths and crossings can be expensive There is a wide range of existing program materials to help plan and implement safe routes Safer walking routes will encourage adult walking as well
Employees of the ACT government should be provided with subsidised public travel passes. Private sectors employers should be encouraged to provide the same service	Observational	promising	Purchase of annual travel passes through salary sacrifice or pay deductions has been shown to increase use of public transport (Lachapelle and Frank 2009, Ogilvie et al. 2007, Jones 2012). This should be available to government employees	Not all employees are equally able to benefit from such a scheme
Pedometer based behavioural programs	Range of experimental studies	promising	Wearing a pedometer has been shown to be a ACE report assessed this as having sufficient evidence (Vos et al. 2010)	

Recommended actions	Evidence	Level of promise	Commentary/Rationale	Considerations
Active travel to school programs	Mostly observational, some RCT	some promise	<p>Travel to school provides an opportunity for children to engage in physical activity. Such programs usually contain an educational component with a focus on health and road safety, supervised walking to school programs (walking buses), cycling groups and even car-pooling</p> <p>Many programs have been able to demonstrate improved participation rates over the life of the program and some have shown a very small net increase in physical activity (Wen et al. 2008a)</p>	<p>A considerable amount of organisation is required</p> <p>Need to broaden appeal to girls and less fit children</p> <p>Large amount of existing resources and guidance on establishing and maintaining program</p>

Recommendations

Improving the level of active transport and reducing the use of cars for short trips has great capacity to improve physical activity levels by small but meaningful amounts. It also brings many other benefits in terms of the environment and road infrastructure costs. The ACT is currently very car dependent for its transport options but given the size, geography and governance structures, the ACT government is in a unique position to promote active travel.

The promotion of increased active transport is highly dependent on having the appropriate infrastructure in place and built into ongoing planning regulation. Thus the promotion of active travel must be a central component of transport and infrastructure master plans for the ACT.

The ACT Government should consider the following options:

1. Ensure a central focus on active travel within transport and infrastructure master-plans to ensure an appropriate level of investment in active travel infrastructure such as footpaths, cycle paths, traffic calming etc. The provision of adequate levels of public transport to all districts of the ACT also needs to be a key focus on these plans
2. Continued investment in the development of a network of linked walking and cycling paths **separated** from motorised traffic
3. The maintenance and expansion of existing comprehensive car use reduction (TravelSmart) activities. A combination of communication, behavioural change and structural change strategies are necessary to achieve change
4. Ensure an ongoing program of cycling and walking events to encourage the trialling of new transport behaviours
5. Develop and test behavioural economic approaches to integrated active travel interventions, with subsidies, reinforcers and rewards, facilitative timetabling and travel planning schedules and social marketing of the initiative
 - Consider the introduction of employer subsidies of travel passes (for all government employees) to reduce financial barriers to using public transport and encourage use on weekends
 - Require the development of organisational travel plans for all government agencies and encourage, through rewards, this activity in all private ACT medium-large businesses
6. Plan, fund and maintain a program of action that enables the development of safe routes to school for all ACT schools to overcome the physical dangers discouraging parents from allowing their children to actively travel
7. Implement a bicycle share scheme to encourage active travel on small trips between major centres within the ACT.
8. Consider the potential gains and risks from making exemptions for adults within the bicycle helmet laws for adults on shared paths, footpaths, and roads less than 40km/hour.

What are the evaluation tools which ACT could use to determine the effectiveness of such interventions?

The evaluation tools identified in 'Transport for Canberra' are appropriate, and are the main tools used globally for monitoring active travel. These include travel surveys including travel diaries, population surveys of frequency of specific travel behaviours and physical activity, bike counts, pedestrian counts, and workplace/school surveys.

Critical review of ACT plan in terms of its IMPLEMENTATION and make recommendations on the suitability of evaluation tools for its evaluation and feasibility of evidence based programs to fit into the ACT plan

'Transport for Canberra' is a high quality transport plan which covers the recommended practices for an effective and efficient transport network which includes a strong active travel component. In terms of implementation in a way that maximises active travel benefits, actions (that are in the plan) that could be prioritised relate to those which would form part of a communication strategy. The ACT already has an extensive cycling and walking network, probably the best in Australia, and promoting the existence of this infrastructure and encouragement of its use would support mode shift to active travel. The results of the Belconnen Travelsmart project (13% reduced car travel) are indicative of the benefits of effective communication.

A communication strategy would incorporate aspects of travel demand management such as organisational travel plans and travel access guides (especially for large trip generators), as well as normalise cycling and (to a lesser extent walking) as a sensible and legitimate travel mode. This communication strategy could position Canberra with a national identity as Australia's premier cycling city. It is out of the scope of the Transport for Canberra Plan, but the development of a tourist cycling/walking trail would assist in branding Canberra as a 'must go' destination.

Communication messages around cycling and walking to work should be a priority before active travel to school. This is because how children travel to school is largely determined by how parents go to work (Wen et al. 2008b), and parents/adults need to be comfortable with active travel before they will allow or encourage their children to do it.

Transport for Canberra could consider a bicycle share scheme, as per Melbourne and Brisbane, as the health benefits are good (Rojas-Rueda et al. 2011). A bicycle share scheme in Australia would likely perform comparably with European schemes if it had an exemption to mandatory helmet legislation (Fishman et al. 2012). Helmet legislation exemption could also be extended to riding on bike paths or footpaths (as is legal in the Northern Territory) and on streets signposted for less than 40km/hour.

The evaluation tools identified to measure project on performance measures are appropriate. Travel surveys are really the only way to get specific data on trips, and mode to allow assessment of changes over time at a population level.

References

1. Bassett DR, Pucher J, Buehler R et al. Walking, cycling, and obesity rates in Europe, North America and Australia. *J Phys Act Health* 2008;5(6):795–814.
2. Bauman A, Rissel C, Garrard J et al. Cycling: Getting Australia moving – barriers, facilitators and interventions to get more Australians physically active through cycling. Melbourne: Cycling Promotion Fund, 2008.
3. Bowles HR, Rissel C, Bauman A. Mass community cycling events: who participates and is their behaviour influenced by participation? *Int J Behav Nutr Phys Act* 2006;3:39.
4. British Medical Association. Healthy transport = healthy lives. London: BMA [Internet] 2012 [cited 6 December 2012]. Available from: <http://bma.org.uk/transport>
5. Brockman R, Fox KR. Physical activity by stealth? The potential health benefits of a workplace transport plan. *Public Health* 2011;125(4):210–216.
6. City of Perth Department for Planning and Infrastructure. TravelSmart Household Final Evaluation Report. City of Perth, July 2008.
7. Daley M, Rissel C. Perspectives and images of cycling as a barrier or facilitator of cycling. *Transport Policy* 2010;18(1):211–216.
8. Fishman E, Washington S, Haworth N. Barriers and facilitators to public bicycle scheme use: a qualitative approach. *Transportation Research Part F: Traffic Psychology and Behaviour* 2012;15(6):686–698.
9. Fraser S, Lock K. Cycling for transport and public health: a systematic review of the effect of the environment on cycling. *Eur J Public Health* 2011;21(6):738–743.
10. Heath GW, Brownson RC, Kruger J et al. The effectiveness of urban design and land use and transport policies and practices to increase physical activity: a systematic review. *J Phys Act Health* 2006;3(Suppl1):S55–S76.
11. Hosking J, Macmillan A, Connor J et al. Organisational travel plans for improving health. *Cochrane database of systematic reviews* [Internet]. 2010;(3):CD005575.
12. Jones T. 2012. Getting the british back on bicycles - the effects of urban traffic-free paths on everyday cycling. *Transport Policy* 2012;20:138–149.
13. Krizek KJ, Forsyth A, Baum L. Walking and cycling international literature review- final report. Melbourne: Victoria Department Of Transport, Walking And Cycling Branch, 2007.
14. Lachapelle U, Frank LD. Transit and health: mode of transport, employer-sponsored public transit pass programs, and physical activity. *J Public Health Policy* 2009;30(Suppl1):S73–94.
15. McMillan TE. Walking and biking to school, physical activity and health outcomes. Active Living Research brief. San Diego, Robert Wood Johnson Foundation, 2009.
16. Miskell S, Xu W, Rissel C. Encouraging community cycling and physical activity: a user survey of a community bicycle loan scheme. *Health Promot J Austr* 2010;21(2):153–154.
17. Morrison D, Thomson H, Petticrew H. Evaluation of the health effects of a neighbourhood traffic calming scheme. *J Epidemiol Community Health* 2004;58(10):837–840.
18. National Institute for Health and Clinical Excellence. Walking and cycling: local measures to promote walking and cycling as forms of travel or recreation. NICE public health guidance 41 [Internet]. 2012 [cited 6 December 2012]. Available from: <http://guidance.nice.org.uk/PH41>
19. Ogilvie D, Foster CE, Rothnie H et al. Interventions to promote walking: systematic review. *BMJ* 2007;334(7605):1204.
20. Owen N, Humpel N, Leslie E et al. Understanding environmental influences on walking: review and research agenda. *Am J Prev Med* 2004;27(1):67–76.

21. Pucher J, Buehler R. Making cycling irresistible: lessons from the Netherlands, Denmark and Germany. *Transport Reviews* 2008;28(4):495–528.
22. Pucher J, Dill J, Handy S. Infrastructure, programs, and policies to increase bicycling: an international review. *Prev Med* 2010;50(Suppl1):S106–S125.
23. Pucher J, Dill J, Handy S. Infrastructure, programs, and policies to increase bicycling: an international review. *Prev Med* 2010;50(Suppl1):S106–S125.
24. Rissel C, Curac N, Greenaway M et al. Physical activity associated with public transport use —a review and modelling of potential benefits. *Int J Environ Res Public Health* 2012;9(7):2454–2478.
25. Rissel C, Garrard J. Cycling for active transport and recreation in australia: status review and future directions. *World Transport Policy And Practice* 2006;13(1):49–63.
26. Rojas-Rueda D, de Nazell A, Tainio M et al. The health risks and benefits of cycling in urban environments compared with car use: health impact assessment study. 2011;BMJ 343.
27. Rose G, Marfut H. Travel behaviour change impacts of a major ride to work day event. *Transportation Research Part A* 2007;41:351–364.
28. Saelens BE, Sallis JF, Frank LD. Environmental correlates of walking and cycling: findings from the transportation, urban design, and planning literatures. *Ann Behav Med* 2003;25(2):80–91.
29. Telfer B, Rissel C, Bindon J et al. Encouraging cycling through a pilot cycling proficiency training program among adults in central Sydney. *J Sci Med Sport* 2006;9(1–2):151–156.
30. Vos T, Carter R, Barendregt J et al. Assessing cost-effectiveness in prevention (ACE–prevention): final report. Brisbane and Melbourne: University of Queensland and Deakin University, 2010.
31. Wen LM, Fry D, Merom D et al. Increasing active travel to school: are we on the right track? A cluster randomised controlled trial from Sydney, Australia. *Prev. Med* 2008;47(6):612–618.
32. Wen LM, Fry D, Rissel C et al. Factors associated with children being driven to school: implications for walk to school programs. *Health Educ Res* 2008;23(2):325–334.
33. Wen LM, Orr N, Millett C et al. Driving to work and 18. Overweight and obesity: finding from the 2003 New South Wales Health Survey, Australia. *Int J Obes (Lond)* 2006;30(5):782–786.
34. Wener RE, Evans GW. A morning stroll: levels of physical activity in car and mass transit commuting. *Environment and Behaviour* 2007;39(1):62–74.
35. Yang L, Sahlqvist S, Mcminn A et al. Interventions to promote cycling: systematic review. *BMJ* 2010;341:c5293.
36. Zander A, Rissel C, Bauman A et al. Cycling to work in Sydney: analysis of journey-to-work census data from 2001 to 2011. Sydney: Prevention Research Collaboration, University of Sydney, 2012.

4 Workplace interventions

Research Question: What are the most effective workplace-based interventions (for example, programs and services, environmental modifications, regulation) to increase physical activity, decrease consumption of energy dense nutrient poor foods, and/or increase consumption of vegetables and fruit across the working population of the ACT?

Primary focus is on worker-based interventions delivered in workplaces, rather on workplaces per se; interventions should only be included if applicable/feasible in a broad range of ACT workplaces.

Identify where those interventions that have been integrated with other workplace co-interventions.

Description of search methods

- PubMed (Cochrane, Medline, PsycInfo), Google Scholar, Google
- Literature Reviews since 2000
- Single peer-reviewed studies 2010–2012 only
- Search terms: (workplace[Title], worksite[Title] OR worker(s)[Title] OR employer(s)[Title] OR employee(s)[Title]) AND (weight OR body mass index OR physical activity OR exercise OR fruit OR vegetables OR diet OR nutrition) AND (review OR intervention OR program OR policy)
- A separate search was conducted for cost-effectiveness studies of workplace health promotion programs.

Scope of the literature

Four types of literature were identified:

- Reviews published in peer-reviewed journals
- Reviews published in the grey literature (online; not peer-reviewed)
- Single studies published post-reviews (late 2010, 2011 and 2012)
- Workplace guidelines/best practice documents.

Recommendations by peak bodies (such as the CDC, WHO, Harvard School of Public Health) were also consulted.

Analysis of research evidence

Overall comments

The evidence can be divided into two types: (i) evidence of effectiveness of specific programs or studies involving single or multifaceted intervention components and types; and (ii) evidence of best-practice elements for successful (in terms of planning, design, implementation and evaluation) and effective workplace health promotion. Both types of evidence are included in this review as the former (i.e. specific interventions or programs) are generally not effective without best-practice planning, design and implementation having been followed.

The recent interventions evidence focuses on comprehensive worksite wellness programs (WWPs) in the US, multi-component worksite health promotion programs [WHPPs; essentially the same as WWPs but a broader term to encompass programs outside of the US], individualised programs involving health risk assessments (HRAs) often with follow-up (HRAF) advice and support activities (face-to-face, telephone-based, web-based, emails) and environmental interventions. The latter are rarely described as being combined with policy – policy options in the workplace have been scarcely evaluated. Environmental interventions encompass those aimed to increase the availability and access to healthy foods (and reduce availability and access to unhealthy foods – note these approaches are not necessarily combined within the same intervention), and those that are aimed at encouraging physical activity (PA).

A large number of reviews in the grey literature provide advice and recommendations on best practice in terms of facilitating WHP upstream. For example, Vaughan Jones and Barham (2010), from a large report examining 'Healthy work: Evidence into action' in the UK (BUPA), provide broad recommendations for government, for employers and for providers of workplace health interventions. A large number of other reports and reviews identify more specific best-practice options and elements that can be applied at the individual organisation level (cf. appendices).

Broad findings from reviews

It is widely accepted that a comprehensive approach, combining programs with policy implementation and environmental changes, is the key to successful, sustainable health promotion initiatives (Curry 2012; grey literature review). The systematic review by Kahn-Marshall et al. (2012) indicated that there was inconclusive evidence for workplace environmental and/or policy only; that there was overall moderate evidence for the effectiveness of multi-component programs using environmental and/or policy changes in addition to individual-level strategies on improving fruit and vegetable (F&V) intake, fat intake and physical activity. The review by Thorndike (2011) indicated that although there is good evidence for individual-based worksite programs in terms of achieving modest weight loss, the effects on other risk factors and on long-term health outcomes and costs were inconsistent. He also indicated that effectiveness of environmental interventions was uncertain. He highlighted the need for balance between effectiveness and economic viability.

Cancellier et al. (2011) indicated that preliminary evidence of successful interventions to reduce presenteeism included:

- (i) Involving supervisors in WHPPs
- (ii) Targeting organisational and/or environmental factors to influence behaviour
- (iii) Screening workers prior to intervention using HRAs
- (iv) Allowing PA to occur during work hours
- (v) Individually-tailoring programs.

Only one review identified the extent of change in dietary and PA outcomes that can be expected from WHPPs (Jensen et al. 2011). This review aimed to examine if worksite nutritional programs can improve productivity and profitability. These reviewers indicated that worksite interventions may be capable of increasing daily intake of F&V by 0.3-0.5 servings, and the intake of dietary fibre by 1-2%, and of reducing fat intake by 1-10%. Ni Mhurchu et al. (2010) identified 8 studies focused on employee education and 8 focused on changing the worksite environment (alone or in combination with education); they concluded that WHPPs are associated with moderate improvement in dietary intake, although the quality of studies has been poor. A review of nutrition interventions in the workplace (Steyn et al. 2009) indicated that a large number of diverse interventions had been successful in changing outcomes positively. Key success factors were: (a) a nutrition and PA component (b) dietitians were involved in the nutrition education (c) changes occurred in the cafeteria/canteen which increased the availability and advertising of healthy food options (d) tailored feedback on diet (and clinical values) (e) employees involved in planning and managing programs (f) reduced prices of healthy food items in vending machines encouraged employees to buy healthier options, and (g) stages of change theory was most commonly associated with best practice outcomes.

The systematic review of lifestyle-focused interventions in the workplace to reduce cardiovascular disease (Groeneweld et al. 2010) found that the 3 intervention strategies most frequently used were individual counselling (n=18), group education (n=15) and supervised exercise (n=11). These reviewers found strong evidence for a positive effect on overall body fat but not on body weight, blood pressure, serum lipid profile, blood glucose and triglycerides. There was, however, strong evidence; except for body weight among high risk individuals.

The WHO (2009) combined a mixture of interventions and best-practice elements in their list of effective components of multi-component workplace interventions to combat chronic disease: (a) providing healthy food and beverages at workplace facilities, (b) providing space for fitness, (c) involving employees in program planning and implementation, (d) involving families in interventions via self-learn programs, newsletters, festivals, etc, and (e) providing individual behaviour change strategies and self-monitoring. Approximately half of the reviewed interventions (19/38) interventions had positive psychosocial changes in knowledge, attitudes and/or self-efficacy; positive behaviour changes were reported in 25/38 studies.

The meta-analysis of workplace PA and diet interventions on weight outcomes by Verweij et al. (2010), indicated that there was moderate quality of evidence that workplace PA and diet interventions significantly reduce body weight, BMI and body fat percentage; that there is low quality evidence that workplace PA interventions significantly reduce body weight and BMI. Effects on body fat could not be properly investigated due to lack of studies. Sub-group analysis showed greater reduction in body weight of PA and diet interventions containing an environmental component.

The systematic review by Anderson et al. (2009) considered that there was strong evidence that workplace interventions aimed at improving nutrition, PA or both have a modest effect on weight, and that this is applicable to men and women in a range of workplace settings. More, or

more intensive, intervention components appeared to increase program effects. The meta-analysis of workplace PA programs considered that they are effective in improving health and work-related outcomes.

An evidence review specifically aimed at Australia (Bellew 2008) indicated that there was strong to definitive evidence for the effectiveness of PA interventions with the following strategies: (a) prompts to increase stair use; (b) access to places and opportunities for PA; (c) education, employee and peer support; and (d) multi-component interventions combining nutrition and PA. Bellew also identified strong to definitive evidence for (e) nutrition interventions that were multi-component (included PA and nutrition, e.g. nutrition education, dietary prescription, behavioural skills development); (f) improved access to and availability of nutritious foods, and (g) promotional strategies at point-of-purchase. Also, there was strong to definitive evidence that comprehensive or multi-component programs were effective for reducing individual risk for high risk employees.

Earlier reviews such as that by Matson-Koffman et al. (2005) echo the findings of these later reviews, e.g. indicating that the strongest evidence for influencing PA and nutrition behaviours was for interventions that involved stair prompts; access to places and opportunities for PA; comprehensive worksite approaches, including education, employee and peer support for PA, incentives and access to exercise facilities; the availability of nutritious foods; and point-of-choice/purchase strategies.

Program reach

Selection bias was high in a lot of studies such that only those most interested in health took part in the WHPPs. There is therefore need to think creatively about how to engage employees across the health [and population] spectrum to participate (Freak-Polli 2012b).

Individual programs – especially those combined with HRAs with follow-up can reach those most at risk and these offer the most potential for the largest improvements/gains but cost-effectiveness is uncertain. Also, individually-based programs should not be undertaken without providing appropriate physical and social support, such that the healthy choices become the easy/ier choices. There is some evidence that programs should not focus on weight per se but on PA and nutrition interventions and outcomes; however incentive-based weight-loss programs involving individual and team challenges, underpinned with appropriate physical and social support, have been implemented successfully. There is the need to provide a range of components to achieve sustained change in BMI.

The systematic review by Robroek et al. (2009) indicated that programs that provide incentives and multi-component programs are most likely to attract participants. Also, interventions that target multiple behaviours attract more participants than interventions that only target PA.

Importance of context

In 1986 Orlandi et al. indicated that providers of WHP interventions have tended to ignore the concept of 'fit' between a particular program and a particular organisational setting into which it is introduced. Studies have underestimated the role that unique corporate structures and decision-making processes can play in determining program adoption and maintenance. These authors described three sets of factors related to effective dissemination and implementation of worksite health promotion innovations – the availability of the innovations, the acceptability of the innovations to the employees and other end users, and the feasibility of the innovations from the perspective of the corporate decision-makers. Not much has changed since then. The

recognition that one-size does not fit all is underpinned by a number of best practice planning and implementation guidelines or processes.

- Successful WHP initiatives combine health education with changes in physical and social environment
- Underpinned by management buy-in and employee ownership targeted to each unique workplace and cultural setting
- Involve baseline testing and follow-up to constantly evaluate and monitor programs – and to allow for employee feedback to facilitate program improvement.

Companies must do more than pay lip service – there must be processes to help individuals to take control of their lifestyles and conditions after HRAs (high risk assessments).

Governments can play their part by providing incentives through tax breaks, matched health benefit contribution and stricter legislations on workplace health and safety. A further suggestion is that an international workplace health body be established which could provide guidelines for programs that address regional situations (C3, 2011).

The review by Sorenson et al. (2004) examined workplace initiatives to increase F&V consumption and indicated many of the best practice elements listed in the next section (e.g. environmental/organisational initiatives rely on management support, supportive organisational structures, based on social ecological processes, include worker participation in program planning and implementation, address multiple (vs. single) risk factors for change). However, these authors also indicated the importance of integrating workers' broader social context (e.g. families, neighbourhoods) – there is a need to fit the program/interventions to employees and the individual worksite.

Different sized workplaces will be able to implement different strategies to different degrees. Small and medium sized businesses are often perceived to lack the resources needed to run major workplace initiatives. However, this is something of a misconception (C3) as smaller workplaces have a number of advantages – they can make change more evident, and many employees interact with each other on a daily basis and this can create friendly peer competition to improve personal health. However Hannon et al. (2012) showed that employers of mid-sized businesses faced significant barriers to implementation including cost, time, logistical challenges and an unsupportive culture. Employers were keen to work with non-profit agencies and WHP vendors to offer WHP programs that are inexpensive, turnkey and easy to adapt.

Cost-effectiveness

The return on investment from WHPPs is evidenced by larger companies scaling up programs after pilot studies (e.g. see Case Study). A number of the best practice guidelines and reports indicate substantial numbers of generally multi-component WHPPs in Australia that have been adopted and adapted. Ongoing evaluation and adaptation is necessary.

The systematic review of workplace screening programs for chronic disease prevention by Bellew et al. (2012) indicated that there was sufficient evidence that for every dollar invested in these [WHP] programs, an annual gain of \$3.20 (range \$1.40 to \$4.60) can be achieved. Van Dongen et al. (2011) conducted a systematic review on the financial return from worksite programs aimed at improving nutrition and/or physical activity and concluded that these programs generated financial savings in terms of reduced absenteeism costs, medical costs or both according to non-randomised studies, but these savings were not apparent when the findings from RCTs only were considered. These authors consider that as these programs are associated with additional types of benefits conclusions about their overall profitability cannot be made. A modeling study by

Trogon et al. (2009) indicated that low-cost policy or environmental change interventions in worksites were likely to be more cost saving than high cost, individually-targeted behavioural change interventions unless they result in substantial weight loss. However, this study focused only on weight as an outcome with regard to return on investment, and savings were determined only in terms of medical expenditures and absenteeism. Inclusion of other health and wellbeing outcomes is likely to have indicated a different scenario in terms of return on investment.

An observational study of a comprehensive WWP delivered by an external company in the US and involving wellness coaches, personal trainers, 24-hour fitness centre, personalised HRA, screenings, and which was expanded to include healthier food options, cash incentives, health newsletters and education workshops, was highly effective and showed an overall return in investment of 2.43 (Davis et al. 2009). Another multi-component program – the ‘Tune up your Heart’ program in the company DaimlerChrysler Canada Inc – resulted in cost-savings. Effects were sustained after 12 months in this program which involved goal-setting, self-monitoring, screening/HRA, and company-wide education programs. Mean BMI reduction was only 0.2 kg/m² but significant improvements in metabolic measures were observed.

Evidence of effectiveness of specific interventions

Policy

Despite a large number of systematic and grey literature reviews indicating that ‘environmental and policy changes are increasingly recognised as essential components of workplace health promotion that complement individually-targeted strategies for changing behaviours’ (Kahn-Marshall and Gallant 2012), and ‘workplace policy and environmental strategies are an essential component in any initiative aiming to bring about long-term population changes in employee physical activity’ (Curry et al. 2012); the majority of these reviews do not highlight evidence to support the effectiveness of policy approaches. The Task Force on Community Preventive Services (Anderson et al. 2009) considered that there were unanswered questions about the effectiveness of environmental and employer policy changes on employee weight status.

Generally reviews have considered environmental interventions in combination with policy interventions or alone (Engbers et al. 2005, Mattson-Koffman et al. 2005, Anderson et al. 2009, Archer et al. 2011, Curry 2012, Kahn-Marshall and Gallant 2012); despite this, few policy approaches have been evaluated either in combination or alone. Indeed, the most recent of these reviews by Kahn-Marshall and Gallant (Dec 2012; *‘making healthy behaviours the easy choice for employees: a review of the literature on environmental and policy changes in worksite health promotion’*) identified only 2 out of 27 included studies examining the promotion of nutrition and PA in the workplace using environmental and/or policy intervention, that specifically mentioned the word ‘policy’. These two studies were both conducted in 1999 and were catering policies to offer healthier options during meetings and events.

Healthier catering policies in workplaces have been detailed by the Heart Foundation in Australia as being important. They are indicated to help drive cultural change within organisations as a long-term commitment to healthier food and drink choices. A workplace healthy catering policy makes it easier for everyone to follow consistent catering practices. The Heart Foundation considers that such policies should apply to all workplace catering, internal and external, including staff meetings, shared morning and afternoon teas, breakfast meetings, Christmas parties, conferences, seminars, fundraising events, launch parties and community events. Similarly, the CDC in America has a policy ‘Choosing foods and beverages for healthy meetings, conferences and events’.

In the review in the grey literature by Curry (2012), the literature indicated the following as potential policy approaches for workplace promotion of physical activity: (i) allowing flexible

work time for employees to engage in PA; (ii) allowing/encouraging breaks from prolonged sitting; (iii) adopting transport plans or employee commute plans (cf. Active Transport section); (iv) providing subsidies to employees who want to take part in PA outside of work. This author also identified that the provision of childcare during after-hours may support PA participation.

Vaughan-Jones et al. (2010) provided recommendations for government regarding workplace health promotion and included the recommendation that government 'improve coordination of government policy on workplace health – to further emphasise the link between organisational performance, national prosperity and the health of the nation's workforce. Hooper and Bull (2009) considered that organisational policy to support healthy lifestyles should be developed to ensure long-term commitment resourcing and sustainability integrated within one or more policy areas. Earlier the UK National Institute of Health and Clinical Excellence (NICE, 2004) indicated that one of the successful elements of WHP programs is to combine population-based policy initiatives with intensive individual- and group-based interventions.

In California, the Department of Health Services has indicated that community organisations are often well positioned to work with local governments to bring about change. Community organisations can work with government agencies to provide safe physical activity areas near worksites and to work with employers to accommodate worksite programs. On a state-wide level, community organisations can work with legislators and legislative staff to bring about policy changes that help promote worksite nutrition and physical activity. One such area is corporate liability. Employer focus groups indicate that if companies had protection from liability for promoting physical activity (similar to 'Good Samaritan' laws), they would be more inclined to provide on-site physical activity opportunities. Another area might be establishing food service standards in all public buildings, such that at least 50 percent of food served meets guidelines for healthy food choices.

The CDC indicates that flextime [flexitime] can provide more PA opportunities for employees. Flexible times for beginning and ending work each day, or 'flextime,' policies can be useful in creating opportunities for employees to engage in physical activity during the day yet maintain their expected number of work hours. Flextime policies allow employees to shift their work schedules, such as coming in earlier or later or taking a lunch break at alternate times. The CDC website has links to a number of organisational PA policy templates, e.g. the CDC 'alternative work schedule' policy; The Utah Department of Health has developed an exercise and health activity time policy for its employees that can be adapted for other worksites; the Oregon Department of Human Services has developed a Healthy Worksites toolkit that included guidance on establishing policies to support PA at work as well as a sample flextime policy. Other CDC internal policies include the CDC 'Fare Share Program' which allows employees to be reimbursed for a portion of expenses incurred for using public transportation; a 'Lactation Support Program'; and a 'Purchase and use of kitchen appliances' policy.

The CDC website also contains specific policies that impact health promotion at federal workplaces. These policies are formal laws, regulations and rules that have been adopted on a collective basis to guide individual and collective behaviour at the federal workplace. These include: alternative transportation policies; establishing wellness programs policies; worksite built environment policies (policies that affect structural features of the federal workplace which may impact an employee's ability to make healthy PA and nutritional choices while working).

In summary, there is a scarcity of experimental evidence to support the implementation of workplace policy to encourage and support healthy eating and physical activity; yet such policy approaches are recognised by peak bodies and a large amount of literature as being essential to underpin environmental changes and to make healthy choices the easier choices for workers.

Environmental changes to support physical activity (PA)

Provision of on-site facilities that support PA such as walking paths, secure bike storage, showers, lockers, change rooms and gyms have been shown to effectively support PA.

- **Stair prompts**

The Community Guide Task Force recommended in May 2001 that point of decision prompts to encourage use of stairs be implemented. Stair prompts and improvements to stairwell aesthetics have been determined to be effective in a number of reviews of workplace interventions (e.g. Chau 2009; Hooper and Bull 2009, Curry et al. 2012). A single study by Meyer et al. (2010) noted an increase in staircase units from 4.5/day to 20.6/day after 12 weeks when posters and floor stickers were placed to encourage stair use in a university hospital building with elevators in the US. However, the number of staircase units decreased to 7.2/day after 6 months. A systematic review of such interventions by Nacon et al. (2010) indicated that most studies reported an increase in stair climbing after an intervention with point-of-choice prompts when the alternative is an escalator (e.g. in shopping malls), while the majority of elevator settings (i.e. workplaces) did not find significant changes. The systematic review by Dugdill et al. (2008) indicated that there was limited evidence that stair use interventions (prompts, messages) were effective for increasing stair use.

- **Enhanced access to PA opportunities**

The Community Guide Task Force recommended in May 2001 the creation of or enhanced access to places for PA combined with informational outreach activities in workplaces to increase PA. The systematic review by Archer et al. (2011) indicated that enhanced access to opportunities for PA combined with health education was successful. This review also indicated that exercise prescription alone was effective (contrary to the review by Wong et al. 2012). It is possible that education alone may be more successful among women than men.

- **Reduced sitting and PA breaks**

Treadmill workstations have resulted in significant increases in standing time and steps, and decreases in sitting time, waist and hip circumferences, and cholesterol, as well as improvements across the metabolic profile particularly among overweight and obese office workers (John et al. 2011).

Fifteen minute 'booster-breaks' - co-worker led group PA sessions – were found to be feasible and highly effective in terms of weight loss (mean of approx. 6.3 kg) in one study (Taylor et al. 2010).

The systematic review by Barr-Anderson et al. (2011) indicated that the integration of short bouts of PA into organisational routine generally improved the accumulation of meaningful amounts of PA, although many of the studies contributing to this overall finding were in schools rather than workplaces (12/40). However, the systematic review by Chau et al. (2010) found no evidence for studies to effectively reduce sitting time. The included studies were generally not representative.

Emerging evidence supports the use of sit-stand desks, and standing meetings, for example, in decreasing sitting time. However, this literature is not reviewed for the current review.

- **Walking programs/pedometers**

Selection bias is large in studies involving pedometers as a strategy to encourage more steps/day. Pedometers were a useful addition to a step-by-step self-help (guidebook) walking program in Australia (Borg et al. 2010) where newsletters as a strategy to enhance long-term maintenance had no additional effect. In a program among 399 hospital employees in Australia, a pedometer, water bottle, healthy cookbook and sandwich container, together with 'Measure

Up' campaign resources were effective at increasing the number of minutes walked and vigorous PA. Consumption of breakfast and F&V also increased. De Cocker et al. (2010) indicated that an intervention effect was only obvious among already active employees, and highlighted the need for future workplace programs to give extra attention to inactive employees. They can be a useful component of Corporate Challenge type programs (e.g. Hector et al. 2011 unpublished, Freak-Polli et al. 2011); however there is a preference for use among women and white-collar workers. The systematic review by Dugdill et al. (2008) indicated some evidence that workplace interventions to promote walking using pedometers are effective for increasing daily steps (in large companies).

Environmental changes to support healthy eating

A range of options exist to improve the food environment in worksites to increase the availability of healthy foods and reduce the availability of unhealthy foods and drinks. The 4 P's of marketing have been applied to the food environment in workplaces (as they have in schools): *Products* that are healthy and appealing, *Placement* of healthy foods in easily accessible locations; *promotion strategies* to inform and encourage selection of healthier foods (signage, icons); *price* the healthier foods to encourage employees to purchase them. These four principles have been adopted in the *HealthWorks* program which includes: (i) increased availability of calorie smart foods to at least 50% of all cafeteria and vending machine offerings; (ii) reduce the price of calorie smart foods by 15% while increasing the price of non-calorie smart foods by 15%, (iii) offer smaller portion sizes as substitutes in cafeteria lines and in vending machines (e.g. bottles of soft drink), and (iv) label calorie smart items at the point of purchase and promote these items through table tents in the cafeteria and posters near vending machines (Linde et al. (2012). Overall, the systematic review by Kahn-Marshall et al. (2012) showed that the nutrition-focused environmental interventions were of relatively low cost to implement and showed a positive effect on dietary behaviours (although studies were methodologically poor). Similarly the systematic review by Engbers et al. (2005) indicated strong evidence from multi-centre trials that environmental modifications to the food environment have positive effects on dietary intake. Modifications included: food labeling, provision of healthy choices in canteens, and vending machines.

- **Provision of Free Fruit**

Two European controlled trials conducted in 2011 showed that the provision of free fruit in an easily accessible place led to increase fruit intake. In one study fruit intake increase by 112g, dietary fibre intake also increased and intake of sugar decreased over a period of 5 months (Alinia et al. 2011). In the other study, availability of free fruit in the workplace led to significant increases also in vegetables intake and purchasing of fruit and vegetables for the family, as well as increased self-efficacy towards eating fruit (Backman et al. 2011). Bandoni et al. (2011) found that an increased availability of F&V plus education and motivation to eat more F&V in workplace canteens in Brazil led to slight increases in consumption (11g). Provision of free fruit was included in the multi-component 'Vital@Work' program in the US (Stijk et al. 2012). This program also included yoga, exercise sessions, and 3 visits to a personal vitality coach. Increases were observed in participation in sports activities and in fruit intake; however a similar program showed that impeding factors for participation in the activities needed to be investigated.

- **Increased availability of Fruit and Vegetables in cafeterias**

Several studies trialing an increase in availability of F&V in cafeterias have produced positive results (Bandoni et al. 2010; Thorsen et al. 2010). Thorsen et al. (2010) showed that a worksite canteen serving more F&V produced sustainable increases in F&V consumption over a 5-year period in Denmark. This intervention involved working with canteen managers using a

participating and empowering approach that encouraged self-monitoring and a dialogue with suppliers, and networking among canteens.

- **Increased availability of healthier foods in cafeterias**

In Denmark, changes to the canteen environment and informational and dialogue initiatives, plus organisational changes to health policy (the 'Food at Work' study), resulted in daily decreases in fat, cake and sweets intake, and increases in dietary fibre (Lassen et al. 2011a). This study also showed that worksite canteens may make a significant difference in reducing the percentage of energy from fat. The study was among blue-collar workers and involved the union and a large commitment by the companies. Strategies need to change the nutritional content of all meal types, making them more appealing and accessible for customers with different food choice preferences. Lassen et al. (2011a) considered that the provision of an assessment tool directed at worksite canteens would be valuable in conducting self-assessment and setting targets. In another study by these authors (Lassen et al. 2011b), the availability of healthy canteen takeaway meals to take home to families resulted in a reduction in energy density consumption overall and increased vegetables intake.

Multi-component (MC) Programs

Single component programs to increase PA among male workers have been shown to produce insignificant effects (Wong et al. 2012). Study single components included: encouragement to do free-choice PA; an education program and a self-supervised fitness program; PA counselling; print materials.

Multi-component programs have been consistently identified as being effective (large number of systematic reviews and single studies); although many have not been evaluated in randomised, controlled trials due to the nature of the many components and the overall size of the programs. The systematic review by Kahn-Marshall et al. (2012) indicated that the strongest evidence was identified for multi-component interventions involving the environment and physical activity and nutrition-focused programs. Contrary to this finding, the systematic review by Maes et al. (2012) indicated that there was less evidence for combined nutrition and PA interventions compared to educational and multi-component dietary interventions. The systematic review by Maes et al. (2012) indicated that there is moderate evidence of effect of educational and multi-component dietary interventions on dietary behaviours and potential dietary determinants of such behaviours. None of the identified studies were strong in quality. The systematic review by Osilla et al. (2012) on worksite wellness programs in the US indicated that there was mixed evidence for a positive impact of WWPs on PA, diet and weight. Approximately half of the included studies reported favourable findings; also the effects were generally small for improved diet and exercise-related outcomes, especially for dietary behaviour, or not reported explicitly. Earlier systematic reviews indicated stronger evidence of effectiveness of multi-component interventions. For example, Katz et al. (2005) recommended multi-component programs that include PA and nutrition including such strategies as: providing nutrition education or dietary prescription, PA prescription or group activity, and behavioural skills training and development. They considered there was insufficient evidence to determine effectiveness of single component interventions targeting nutrition, PA, or cognitive change alone.

The CDC indicates that a core WHPP needs to establish a core set of 3 to 5 interventions from an available menu of options that includes a mix of *program* (education and counselling), *policy* and *environmental support* (e.g. worksite farmers market, healthy foods in cafeterias and vending machines, stairwell enhancement, walking trails/clubs, flexi-time policy).

- **MC – Environmental changes only**

Several recent studies have shown that environmental changes alone are generally not sufficient to reduce BMI or weight (Linde et al. 2012, French et al. 2012). Linde et al. (2012) made environmental changes to the PA environment – pedometers, workplace challenges, online step tracking, competitive teams, walking meetings, motivational posters, music in stairwells – combined with changes to the nutrition environment; but these changes did not result in a change in BMI over a two-year period. In the study by French et al. (2012) enhancement of PA facilities, increased availability of and lower prices on healthy vending machine choices, and group behavioural programs, resulted in a significant decrease in energy intake and an increase in F&V intake, but did not affect PA levels of BMI. In the former study, the changes may not have been sufficient to induce change. In the latter study the nil effect on BMI was attributed to the fact that the participants were transit workers who spent most of their day outside of the worksite. Also, some of the implementation sites were unable to implement the interventions fully, e.g. did not have a canteen, and there were difficulties with implementing the healthy vending machines due to coordination of outside contractors. This study highlighted the need to consider the context of the workers and the workplace in designing interventions in this setting. De Joy et al. (2012) indicated that moderate changes to the environment without strong organisational support were not effective in relation to reducing BMI, and process evaluation indicated that implementation was often low. This study showed that environmental interventions are most likely to succeed when they align with other organisational priorities and become part of an organisation's norms and fabric; they are not automatic or inherently permanent, i.e. there needs to be social support for the environmental changes to have an impact.

- **MC – involving Health Risk Assessments (HRAs)**

There is strong evidence from systematic and non-systematic reviews that HRAs when used in combination with other interventions can improve dietary fat intake, blood pressure and cholesterol (Bellew et al. 2012); and that incentives, particularly benefits-linked financial incentives, can be effectively used to encourage participation in risk assessment programs (Hector et al. 2011 unpublished, Bellew et al. 2012). A large number of multi-component individually-focused interventions use HRAs as a screening tool to engage participation by those most at risk. An earlier review by Soler et al. (2010) however, although they also indicated that AHRF (assessment of health risks with feedback) with additional components were effective in reducing dietary fat intake (and alcohol use, blood pressure and cholesterol, as per the review by Bellew et al. 2012), they were not effective in increasing intake of F&V, although there was more modest evidence to support a positive effect on PA. Most studies showed little to no change in body weight and percentage body fat, but a moderate decrease in BMI was observed. These are mixed findings suggesting large heterogeneity in effectiveness perhaps dependent on study design. The reviewers concluded that AHRF is helpful as a gateway intervention to a broader worksite health promotion program that includes health education lasting at least one hour or being repeated multiple times during 1 year and that includes an array of health promotion activities.

- **MC – Individually-focused programs**

Studies have varied from a focus on those at risk of chronic disease (with identified risk factors – high blood pressure, impaired glucose intolerance, high cholesterol, overweight/obese), to more general programs. However, even the general programs tend to be focused on those most at risk, as identified through individual screening or risk assessments. Personal health coaching has been identified as more acceptable to employees than more information-based coaching in a number of studies. Hughes et al. (2011) showed that web-based risk assessment attracted twice as many workers when it was combined with personal coaching (COACH program) than when it was combined with web-based behaviour-specific modules (RealAge), i.e. tailoring to individuals is important. In this RCT, COACH participants experienced twice the number of positive outcomes

(F&V, PA participation, energy from fat) than those in the control intervention (printed health-promotion materials). A study by LeCheminant et al. (2012) aimed to build behavioural capacity and self-efficacy through health coaching and skills and tools. In this study the behavioural change process was divided into weekly manageable doses. This program resulted in a sustained, over 2 years, increase in F&V and the frequency and volume of exercise. As the program became embedded in the workplace, proportional requests for coaching increased. Individually-tailored, telephone-based weight management coaching with up to 5 calls over a median of 250 days showed reductions in weight among overweight and obese workers (Terry et al. 2011). Long-term effectiveness was questioned in an individualised program among overweight female Danish health care workers (Christensen et al. 2011). This program involved an individual diet plan requiring an energy deficit of 1200 kcal/day plus planned leisure-time MVPA of 2 hours/week plus strengthening exercises and cognitive behaviour training during work hours. This program did achieve significant decreases in weight (3.6 kg), BMI, body fat, and increases in aerobic fitness over the 3-month intervention.

In a small study of US employees at risk of diabetes, 12 weeks of healthy lifestyle sessions followed by monthly sessions to 12 months showed a decrease in BMI (-2.23 kg vs. +0.73 control) and waist circumference at 3 months, and this reduced WC was maintained at 12 months, although partial weight regain occurred over the longer-term follow-up (Barham et al. 2012). Goal-setting has been shown to be important in a number of studies (e.g. Groenveld et al. 2011). Not all individually-focused programs have been shown to be effective. A large study across 44 worksites in the UK showed that a toolkit of activities targeting components of the theory of planned behaviour delivered by in-house nominated facilitators resulted in an increase in BMI overall; although blood pressure and resting heart rate decreased.

Systematic reviews indicate that the inclusion of behavioural practices such as goal-setting is necessary to induce behaviour change (e.g. Archer et al. 2011). The systematic review by Hutchinson et al. (2011) indicated that aspects of motivational enhancement such as motivational interviewing and the use of rewards or incentives should be incorporated into programs.

The use of web-based programs, alone, in the workplace is uncertain. Blair Irvine et al. (2011) and Neve et al. (2011) have shown that higher web use increases change but factors associated with higher web use are unknown. Presslet et al. (2010) found that an internet-delivered workplace health program among overweight, sedentary employees in Germany had high dropout rates, regardless of whether a structured or unstructured approach was taken. A team-based 10-week program among 330 hospital employees used internet-support for goal-setting and self-monitoring of weight and PA plus personal support was effective over the short-term (Thorndike et al. 2012). A 9-month internet-based maintenance program immediately following the 10-week program did not improve outcomes beyond the original intervention. Among academics in a Science Centre, a 12-week weight loss program found improvements in weight status independent of live versus internet-based dietetic coaching. This program also involved pedometers and weekly weigh-ins. The use of weight status for incentives, as outcome measures, as goals, has been questioned by the Obesity Society in the US. This body considers that intermediate outcomes of healthy eating and PA are more prudent measures.

The use of personalised emails have been used in at least two studies (Sternfeld et al. 2009, Yap et al. 2009); and these are indicated as a feasible intervention that many workplaces can implement. The ALIVE program (Sternfeld et al. 2009) involved 16 weeks of emails, featuring individually-tailored small step goals, personal homepage with tips, educational materials, and tracking and simulation tools. This program was effective at increasing vigorous PA, F&V consumption, and reduction in marginally-added sugars, even 4 months post-intervention.

Use of emails in a more intensive program may not be cost-effective though – for example Robroek et al. (2012) showed that a more intensive web-based health promotion program

consisting of action-oriented feedback, self-monitoring, possibility to ask questions, and monthly emails did not enhance effectiveness beyond a health check plus face-to-face advice and personal feedback on a website, and it was more costly to implement.

- **MC individually-focused programs involving incentives**

Incentives have been shown to be effective components of a large number of multi-component workplace programs. For example, in the Netherlands the cornerstone of a program among University employees was a multiplatform web-based incentive program that provided \$20 per month to the pay check for one-year post-completion of undertaking a HRA, using a goal-setting tool, and viewing an educational video ('HealthPlus', Byrne et al. 2011). Individual health coaching was offered for those identified in the HRA as at-risk and a large variety of educational information/programs was available. This program was evaluated by examining trends in risk factors over a 7-year period. The majority of risk factors were shown to improve over time with the most consistent change occurring in PA – the proportion of employees exercising one or more days/week increased from 72.7% in 2003 to 83.4% in 2009; the largest improvements occurred in the first two years but improvements continued over the 7 years without regression towards baseline. This program achieved a high participation rate.

In the unpublished review by Hector et al. (2011), nearly all of the 18 peer-reviewed studies and the large amount of grey literature indicated that workplace PA, nutrition or weight health promotion programs involving challenge events, or competition of some sort were effective in increased PA, nutrition or cardiovascular risk factors. Incentives were used in a large number of programs to increase participation or adherence or both; although there was no clear evidence of the relative importance of the incentives compared to other program components. The use of incentives to take part in HRAs seems to be effective in increasing participation. In this review, team competition was more important among men than women, although overall it was found to be a motivating factor and was useful in increasing morale. Weekly weigh-ins were identified as useful to challenges aimed at weight change; pedometers achieved mixed results. Communication via a large number of mediums, not just websites, was deemed important to program success.

Several recent single studies have shown that incentivised programs are most effective among those most at risk – e.g. Yoon et al. 2011, Neville et al. 2011, Merrill et al. 2011. The study by Yoon et al. (2011) showed that a comprehensive program awarding gold medals for fat loss achieved changes in BMI over 3 months from 28.8 to 27.8 kg/m² and body fat decreased from 25.4 to 23.3 kg. Longer-term reductions in BMI were observed in the comprehensive, incentivised program indicated by Neville et al. (2011), and in the Reaping Rewards Program, which provided monetary rewards for healthy behaviours among agribusiness workers (Merrill et al. 2011). This program was also effective at preventing weight gain among healthier workers. These authors indicated that WWPs should seek input from employees to ensure that component activities are relevant. Scoggins et al. (2011) describe a WWP 'Healthy Incentives', which involved HRAs, individual action plans with incentives for participation in activities, education, healthy options in vending machines, gyms, and walking weeks. This multi-component program involving education and environmental change was effective among a wide sector of the workers (less so for men, those under 30 year olds, Asian Americans and graduates) in terms of weight management after 1 and 5 years. Group-based financial incentives were used in the POWER program among male shift workers in Australia (Morgan et al. 2011). A single information session, program booklets, and online components in addition to the incentive program were effective in increasing PA and reducing soft drinks consumption, as well as some metabolic measures.

Lottery-type gift vouchers were used as incentives in a diabetes prevention program within various worksites in Colorado (Dallam et al. 2012). This program involved intensive, one-on-one counselling, support group meetings, and the passive transfer of information. Significant changes were observed across a range of health outcomes including BMI, diabetes risk score and PA;

although the largest improvements were seen with the programs involving one-on-one counselling.

Recommended actions for workplace health promotion to increase physical activity, to improve diet and reduce weight/BMI

 most promising
  very promising
  promising
  some promise
  least promising

Recommended action	Evidence	Level of promise	Commentary/ Rationale	Considerations
Individual Health Risk Assessments (HRA)/Screening with tailored feedback	Systematic reviews Recommended by peak bodies (e.g. CDC, WHO, Harvard School of Public Health)	very promising	Employees who participate in HRAs and receive tailored feedback frequently become motivated to improve their own health by voluntarily participating in workplace wellness initiatives Often, this is the first time employees have become aware of the hazards their current lifestyles pose for their health	The promise of this initiative is reduced substantially if not supported by workplace initiatives to support healthy behaviours Participation can be enhanced using incentives
Individualised counselling (post-HRA) in nutrition and/or PA health behaviours Tailored behaviour change programs and professional guidance and support using face-to-face, telephone or web-based counselling, print materials, voice or SMS messages Should involve <ul style="list-style-type: none"> • goal setting • development of self-efficacy • self-monitoring 	Systematic reviews Reviews in the grey literature Recent single good quality studies Recommended by peak bodies	very promising	HP activities tailored to an individual's needs increase the likelihood of beginning an exercise program and increases the frequency of exercise Individualised programs have resulted in 35% increase in amount of time person spends in PA Goal setting is fundamental in translating intentions to change behaviour into specific actions within a specified time frame Self-efficacy is a commonly identified factor influencing a variety of behavioural changes such as F&V consumption or increased PA	Cost-effectiveness uncertain as needs to be intensive for employees with identified risk factors Individual behaviour change must be supported through building a supportive physical and social environment
Multi-component employee nutrition education and PA participation programs e.g. nutrition education classes and materials, aerobic and strength training, group exercise sessions, training in goal setting and lifestyle	Strong evidence from multiple systematic reviews, grey literature reviews and peak bodies	very promising	Targeting both behaviours (i.e. PA <i>and</i> nutrition) more effective than targeting single behaviours	Must be supported by changes to the physical and social environment

Recommended action	Evidence	Level of promise	Commentary/ Rationale	Considerations
skills, self-help materials, specific dietary plans				
Offer incentives to promote initial and ongoing participation in HRA and WHPPs and engagement in healthy behaviours Can be: <ul style="list-style-type: none"> Financial rewards Gift awards Days off Employee recognition (awards) Medical plan enhancements/ health insurance premiums 	Strong evidence from systematic reviews and grey literature Consistently indicated in review summary findings as highly useful component of HRAs and WHPPs	very promising	Build and maintain motivation around WHP; increase participation rates; foster adherence (WHO 2008) Avoid using BMI as a basis for financial penalties or incentives – if so then health insurance plans should reflect this by including responsible weight loss programs. Goal should be to achieve overall wellness of employees	Important to consider the appeal of the incentive from the standpoint of the participant (survey annually regarding employee preferences) e.g. convenience of time and location, and paid time off may be considered appealing incentives Long-term sustainability and cost-effectiveness unknown
Allow flexible work time or breaks for participation in PA	Recommended by peak bodies; several systematic reviews and grey literature	very promising	Encourages participation in PA	Applicable across different sized workplaces
Provide showers and/or change facilities; bike racks	Identified as important in several systematic reviews (see also active transport section of this review)	very promising	Supports active transport and participation in PA during lunch breaks	Applicable across different sized workplaces
Partnering with local fitness facilities and provision of subsidised or free gym membership	Recommended by peak bodies	very promising	Provides opportunities and reduces barriers to PA. Implementing an incentive for membership fees reduced or subsidised (reduces cost barrier)	Feasible; costly
Increased availability of healthy foods and drinks; decreased availability of unhealthy foods and drinks in cafeterias, vending machines, at meetings, at corporate events Should be underpinned by policies (e.g. healthy cafeteria policy)	Large number of systematic reviews	very promising	Can be improved when developing contracts with food vendors	Improving the quality of food served by food services can be challenging – may be met with resistance by canteen staff and customers May need to be supported by policy, self-assessment tools

Recommended action	Evidence	Level of promise	Commentary/ Rationale	Considerations
Point-of-purchase (POP) marketing of healthy foods (increased access to healthy foods in the workplace) <i>Products</i> that are healthy and appealing, <i>Placement</i> of healthy foods in easily accessible locations; <i>promotion strategies</i> to inform and encourage selection of healthier foods (signage, icons); <i>price</i> the healthier foods to encourage employees to purchase them	Systematic reviews and peak bodies Used successfully in other settings (e.g. schools)	very promising	Making healthy choices easy choices	Need to get canteen managers on board—participative approach
Health education (as part of a multi-component program) should include classes, bulletin boards, newsletters, posters in high traffic locations	Reviews; peak bodies	promising	Health education alone not effective Necessary but not sufficient	Must be part of a multi-component program
Social support e.g. company sports teams, walking clubs, in-house competitions; team challenges	Best practice	promising	Necessary to underpin initial and longer-term individual behaviour change	Difficult to achieve and maintain socially supportive environment
Increase opportunities for PA e.g. onsite gyms, walking paths, exercise sessions	Peak bodies	promising	Walking paths not often used	Not feasible for smaller workplaces
Provision of free fresh fruit e.g. At least one piece per employee per day in easily accessible location	Recent single studies (RCT and controlled trial)	promising	Has potential to reach large proportion of employees. Addresses equity	Long-term cost implications but likely to be cost-effective (as relatively low cost and high effectiveness)
Provide access to clean drinking water E.g. Water fountains (where can refill bottles); bottled water coolers (refills cheaply delivered to office)	Not evidence-based (CDC) Evidence-based in other settings	promising	May displace consumption of sweetened drinks	High feasibility

Recommended action	Evidence	Level of promise	Commentary/ Rationale	Considerations
Lactation support program. Interventions include fridges for storage of expressed breast milk, lactation breaks, private rooms, flexible work hours	Breastfeeding has been linked to the prevention of obesity in a large and increasing number of studies Also breastfeeding linked to postpartum weight loss in some studies	promising	Workplace support for breastfeeding is part of key policy strategies, including National Breastfeeding Strategy	Feasible for most sized workplaces
Promote use of stairs, such as by using signs, or by making stairwells safe and attractive	Mixed evidence Recommended by CDC Most earlier systematic reviews indicated effective	some promise	Effective in situations where there are escalators as options but less so when lifts; overall CDC indicate a median net increase of 53.9% increased stair use; use point of decision signs and make stairwells appealing	Inexpensive; highly feasible; high implementation sustainability; but long-term effectiveness unknown Would not be the only strategy
Enhance benefit coverage for obesity clinical screening, counselling and treatment	CDC, USPSTF	some promise	USPSTF recommends screening and offering of intensive counselling and behavioural interventions to promote sustained weight loss for obese adults	The Obesity Society (US) recommends not using weight as an outcome in workplace health programs – to avoid stigmatising overweight/obese employees
Establish a garden market (farmers market onsite) e.g. Local farmers and growers can come to the worksite and sell fresh produce	Not evidence-based (CDC)	some promise	Extends to family	Feasibility and sustainability unknown
Promote active transport	See section three on active travel			

CASE STUDY – Example of multi-component WHPP

‘Work Safe, Work Well’

Western Australia Department of Commerce (taken from ComCare report who took the information from Western Australian Department of Sport and Recreation and Department of Health (2009) *A resource kit for physical activity and health in the workplace*)

This program was developed in July 2007 as a pilot wellness program based at the West Perth office and expanded to reach the rest of the Department in July 2008. The program included:

- *Needs assessment of staff health concerns and activity requests*
- *Audit of each workplace to assess physical, environmental, educational and local neighbourhood barriers and enablers to leading a healthy lifestyle in the workplace*
- *Health assessments*
- *Information sessions on healthy lifestyle practices*
- *Opportunities for staff to exercise at work, e.g. walks at lunch time and exercise classes*
- *Facilities to enable staff to lead healthier, active lifestyles e.g. bike racks, change rooms, showers*
- *Opportunities for staff to make lifestyle changes e.g. healthy lifestyle/weight loss program*
- *Advertising and promotion of community health events*
- *Subsidies for staff to participate in community health events*
- *Poster campaigns to raise awareness of healthy options/encourage improvements in diet/exercise*
- *Motivational emails; healthy lifestyle articles for departmental newsletters*
- *A range of programs to support our wellness message i.e. workplace massages, meditation sessions, and fruit deliveries*
- *Up-to-date wellness knowledge by attending forums, networking and by conducting research*
- *Regular evaluation and opportunities for feedback and improvements.*

Strengths of the program are considered to include the comprehensive needs assessments, health assessment results, and regular opportunities for feedback and suggestions from employees. The program also has:

- *Financial and upper management support*
- *A dedicated full-time coordinator to facilitate the program (since May 2008)*
- *Comprehensive evaluation conducted regularly*
- *Wide range of programs to cater for all staff's needs/interests.*

Healthy Heart Check Results after one year of program implementation compared with pre-program results showed that healthy weight range increased by 19%, obesity reduced by 12%, normal blood pressure improved by 4%, ideal/desirable total cholesterol increased by 12%, elevated/high stress decreased by 3%, sedentary category decreased by 3%. In the Total Cardiac Risk category, the percentage of staff in the ideal health category increased by 10%. Between 26-54% of staff perceived: improved energy/concentration (56.1%), increased knowledge of health/wellness topics (53.7%), per cent had experienced healthier eating habits (53.7%), improved physical health (46.3%), enhanced motivation (41.5%), increased staff morale (41.5%), improved mental health (39.0%), reduced stress levels (36.6%), better staff relationships (29.3%), increased job satisfaction (24.4%).

Key lessons learned to date:

- *Need champions (volunteers) in each site to motivate and encourage staff participation and assist with meeting program providers*
- *Need strong support from management*
- *Need constant motivation for staff's participation.*

Recommendations

The ACT is in a good position to promote healthy living in and via government workplaces, supported by best-practice principles. Those actions that are likely to most feasible, equitable and effective are:

1. Implement and evaluate flexible work hours policy: including breaks (including short breaks) for participation in physical activity and active transport
2. Create environmental supportive of healthy eating including:
 - Implementation of healthy food and beverage policies and practices (catering for meetings and events; fundraising; canteens, vending machines) – to reduce availability of unhealthy foods and increase availability of healthier foods; including replacing unhealthy items with healthier items in vending machines and canteens; reducing the price of healthier foods and beverages; placing healthier food and beverages in prominent positions and promoting healthier options using point-of-purchase icons or signage
 - provide free fruit
 - establish links with local producers for onsite ‘farmers markets’
 - provide easily accessible fresh, cooled water
3. Create environments supportive of physical activity (and active transport) wherever possible, including:
 - lockers, bike racks, showers, change facilities, stair prompts and stairwell aesthetics
 - partner with fitness facilities for free or subsidised gym membership or provide onsite physical activity facilities (gyms, walking paths) in larger workplaces
 - promote lunchtime walking opportunities
 - promote reduced sitting time, e.g. via standing meetings, standing phone calls
4. Implement wide-scale health risk assessment screening (with incentives for participation) and offer follow-up support for those at risk. This follow-up support would most feasibly be via telephone, e.g. the Get Healthy Information and Coaching Service, but would maximally involve at least an initial one-on-one, face-to-face meeting with a dietitian and/or exercise physiologist (regular follow-up meetings would be preferable but cost-effectiveness uncertain)
5. Run worksite healthy living competitions and challenges as part of multi-component programs and involve families. Use incentives to increase participation and encourage behaviour change; incentives could include financial rewards, days off, employee recognition, medical insurance premium contributions
6. Introduce an awards system for successful implementation of workplace health promotion policies and practices.

References

1. Ackland A, Braham R, Bussau V et al. Workplace health and physical activity program review, final report. Perth: Department of Sport and Recreation, Western Australian Government, 2005.
2. Alinia S, Lassen AD, Krogholm KS et al. A workplace feasibility study of the effect of a minimal fruit intervention on fruit intake. *Public Health Nutr* 2011;14(8):1382–1387.
3. Anderson L M, Quinn TA, Glanz K et al. The effectiveness of worksite nutrition and physical activity interventions for controlling employee overweight and obesity: a systematic review. *Am J Prev Med* 2009;37(4):340–357.
4. Archer WR, Batan MC, Buchanan LR et al. Promising practices for the prevention and control of obesity in the worksite. *Am J Health Promot* 2011;25(3):e12–26.
5. Backman D, Gonzaga G, Sugerman S et al. Effect of fresh fruit availability at worksites on the fruit and vegetable consumption of low-wage employees. *J Nutr Educ Behav* 2011;43(4Suppl2):S113–121.
6. Bandoni D, Sarno F, Jaime PC et al. Impact of an intervention on the availability and consumption of fruits and vegetables in the workplace. *Public Health Nutr* 2011;14(6):975–981.
7. Barbato DL, Sancini A, Caciari T et al. [Dietary intervention programs in the workplace: an effective prevention strategy]. *G Ital Med Lav Ergon* 2010;32(4Suppl):100–103.
8. Barham K, West S, Trief P et al. Diabetes prevention and control in the workplace: a pilot project for county employees. *J Public Health Manag Pract* 2011;17(3):233–241.
9. Barr-Anderson DJ, AuYoung M, Whitt-Glover MC et al. Integration of short bouts of physical activity into organizational routine a systematic review of the literature. *Am J Prev Med* 2011;40(1):76–93.
10. Bellew B. Primary prevention of chronic disease in Australia through interventions in the workplace setting: an Evidence Check rapid review brokered by the Sax Institute (<http://www.saxinstitute.org.au>) for the Chronic Disease Prevention Unit, Victorian Government Department of Human Services, 2008.
11. Benedict MA, Arterburn D. Worksite-based weight loss programs: a systematic review of recent literature. *Am J Health Promot* 2008;22(6):408–416.
12. Borg J, Merom D, Rissel C. Staff walking program: a quasi-experimental trial of maintenance newsletters to maintain walking following a pedometer program. *Health Promot J Austr* 2010;21(1):26–32.
13. Brown HE, Gilson ND, Burton NW et al. Does physical activity impact on presenteeism and other indicators of workplace well-being? *Sports Med* 2011;41(3):249–262.
14. Byrne DW, Goetzel RZ, McGown PW et al. Seven-year trends in employee health habits from a comprehensive workplace health promotion program at Vanderbilt University. *J Occup Environ Med* 2011;53(12):1372–1381.
15. Cancelliere C, Cassidy JD, Ammendolia C al. Are workplace health promotion programs effective at improving presenteeism in workers? A systematic review and best evidence synthesis of the literature. *BMC Public Health* 2011;11:395.
16. Chan CW, Perry L. Lifestyle health promotion interventions for the nursing workforce: a systematic review. *J Clin Nurs* 2012;21(15–16):2247–2261.
17. Chapman LS. Expert opinions on "best practices" in worksite health promotion (WHP). *Am J Health Promot* 2004;18(6):1–6.
18. Chau JY. Evidence module: Workplace physical activity and nutrition interventions. Physical Activity Nutrition and Obesity Research Group, University of Sydney, 2009.
19. Chau JY, der Ploeg HP, van Uffelen JG et al. Are workplace interventions to reduce sitting effective? A systematic review. *Prev Med* 2010;51(5):352–356.

20. Chenoweth D. Promoting employee well-being: wellness strategies to improve health, performance and the bottom line. Society for Human Resource Management Foundation (SHRM), 2011.
21. Christensen JR, Faber A, Ekner D et al. Diet, physical exercise and cognitive behavioral training as a combined workplace based intervention to reduce body weight and increase physical capacity in health care workers – a randomized controlled trial. *BMC Public Health* 2011;11:671.
22. Chung M, Melnyk P, Blue D et al. Worksite health promotion: the value of the Tune Up Your Heart program. *Popul Health Manag* 2009;12(6):297–304.
23. Conn VS, Hafdahl AR, Cooper PS et al. Meta-analysis of workplace physical activity interventions. *Am J Prev Med* 2009;37(4):330–339.
24. Dallam GM, Foust CP. A comparative approach to using the diabetes prevention program to reduce diabetes risk in a worksite setting. *Health Promot Pract* 2013;14(2):199–204.
25. Davis L, Loyo K, Glowka A et al. A comprehensive worksite wellness program in Austin, Texas: partnership between Steps to a Healthier Austin and Capital Metropolitan Transportation Authority. *Prev Chronic Dis* 2009;6(2):A60.
26. De Cocker KA, De Bourdeaudhuij IM, Cardon GM et al. The effect of a multi-strategy workplace physical activity intervention promoting pedometer use and step count increase. *Health Educ Res* 2010;25(4):608–619.
27. DeJoy D, Wilson MG, Padilla HM et al. Process evaluation results from an environmentally focused worksite weight management study. *Health Educ Behav* 2012;39(4):405–418.
28. Dishman RK, DeJoy DM, Wilson MG et al. Move to Improve: a randomized workplace trial to increase physical activity. *Am J Prev Med* 2009;36(2):133–141.
29. Dugdill LA, Brettell A, Hulme C et al. Workplace physical activity interventions: a systematic review. *International Journal of Workplace Health Management* 2008;1(1):20–40.
30. Engbers LH, van Poppel MN, Chin A Paw MJ et al. Worksite health promotion programs with environmental changes: a systematic review. *Am J Prev Med* 2005;29(1):61–70.
31. Flannery K, Resnick B, Galik E et al. The Worksite Heart Health Improvement Project (WHHIP): feasibility and efficacy. *Public Health Nurs* 2012;29(5):455–466.
32. Freak-Poli R, Wolfe R, Backholer K et al. Impact of a pedometer-based workplace health program on cardiovascular and diabetes risk profile. *Prev Med* 2011;53(3):162–171.
33. Freak-Poli R, Wolfe R, Walls H et al. Participant characteristics associated with greater reductions in waist circumference during a four-month, pedometer-based, workplace health program. *BMC Public Health* 2011;11:824.
34. French SA, Harnack LJ, Hannan PJ et al. Worksite environment intervention to prevent obesity among metropolitan transit workers. *Prev Med* 2010;50(4):180–185.
35. Fritsch MA, Montpellier J, Kussman C et al. Worksite wellness: a cholesterol awareness program. *AAOHN J* 2009;57(2):69–76; quiz 77–68.
36. Funk KL, Stevens VJ, Appel LJ et al. Associations of internet website use with weight change in a long-term weight loss maintenance program. *J Med Internet Res* 2010;12(3):e29.
37. Goetzel RZ, Ozminkowski RJ. The health and cost benefits of work site health-promotion programs. *Annu Rev Public Health* 2008;29:303–323.
38. Goetzel RZ, Pronk NP. Worksite health promotion: how much do we really know about what works? *Am J Prev Med* 2010;38(2Suppl):S223–225.
39. Groeneveld IF, Proper KI, van der Beek AJ et al. Lifestyle-focused interventions at the workplace to reduce the risk of cardiovascular disease – a systematic review. *Scand J Work Environ Health* 2010;36(3):202–215.

40. Groeneveld IF, Proper KI, van der Beek AJ et al. Short and long term effects of a lifestyle intervention for construction workers at risk for cardiovascular disease: a randomized controlled trial. *BMC Public Health* 2011;11:836.
41. Harding J, Freak-Poli RLA, Backholer K et al. Change in health-related quality of life amongst participants in a four-month pedometer-based workplace health program. *J Phys Act Health* Forthcoming, 2012.
42. Hartline-Grafton HL, Rose D, Johnson CC et al. Are school employees role models of healthful eating? Dietary intake results from the ACTION worksite wellness trial. *J Am Diet Assoc* 2009;109(9):1548–1556.
43. Hector D, Espinel P, St George A et al. Review of available information on workplace physical activity and nutrition challenges, Prevention Research Collaboration, 2012.
44. Hess I, Borg J, Rissel C et al. Workplace nutrition and physical activity promotion at Liverpool Hospital. *Health Promot J Austr* 2011;22(1):44–50.
45. Hooper P, Bull F. Healthy active workplaces. Review of evidence and rationale for workplace health. Government of Western Australia, Department of Sport and Recreation, 2009.
46. Hughes SL, Seymour RB, Campbell RT et al. Comparison of two health-promotion programs for older workers. *Am J Public Health* 2011;101(5):883–890.
47. Hutchinson AD, Wilson C. Improving nutrition and physical activity in the workplace: a meta-analysis of intervention studies. *Health Promot Int* 2012;27(2):238–249.
48. Jensen JD. Can worksite nutritional interventions improve productivity and firm profitability? A literature review. *Perspect Public Health* 2011;131(4):184–192.
49. John D, Thompson DL, Raynor H et al. Treadmill workstations: a worksite physical activity intervention in overweight and obese office workers. *J Phys Act Health* 2011;8(8):1034–1043.
50. Kahn EB, Ramsey LT, Brownson RC et al. The effectiveness of interventions to increase physical activity. A systematic review. *Am J Prev Med* 2002;22(4Suppl):73–107.
51. Kahn-Marshall JL, Gallant MP. Making healthy behaviors the easy choice for employees: a review of the literature on environmental and policy changes in worksite health promotion. *Health Educ Behav*. 2012;39(6):752–776.
52. Kaspian LC, Gorman KM, Miller RM. Systematic review of employer-sponsored wellness strategies and their economic and health-related outcomes. *Popul Health Manag*, 2012
53. Katz DL, O'Connell M, Yeh MC et al. Public health strategies for preventing and controlling overweight and obesity in school and worksite settings: a report on recommendations of the Task Force on Community Preventive Services. *MMWR Recomm Rep* 2005;54(RR-10):1–12.
54. Krogholm KS, Bredsdorff L, Alinia S et al. Free fruit at workplace intervention increases total fruit intake: a validation study using 24 h dietary recall and urinary flavonoid excretion. *Eur J Clin Nutr* 2010;64(10):1222–1228.
55. Laing SS, Hannon PA, Talburt A et al. Increasing evidence-based workplace health promotion best practices in small and low-wage companies, Mason County, Washington, 2009. *Prev Chronic Dis* 2012;9:E83.
56. Lassen AD, Ernst L, Poulsen S et al. Effectiveness of a Canteen Take Away concept in promoting healthy eating patterns among employees. *Public Health Nutr* 2012;15(3):452–458.
57. Lassen AD, Thorsen V et al. Improving the diet of employees at blue-collar worksites: results from the 'Food at Work' intervention study. *Public Health Nutr* 2011;14(6):965–974.
58. LeCheminant JD, Merrill RM. Improved health behaviors persist over two years for employees in a worksite wellness program. *Popul Health Manag* 2012;15(5):261–266.
59. Lemon SC, Pratt CA. Worksite environmental interventions for obesity control: an overview. *J Occup Environ Med* 2010;52(Suppl1):S1–3.

60. Lemon SC, Zapka J, Li W et al. Perceptions of worksite support and employee obesity, activity, and diet. *Am J Health Behav* 2009;33(3):299–308.
61. Linde JA, Nygaard KE, MacLehose RF et al. HealthWorks: results of a multi-component group-randomized worksite environmental intervention trial for weight gain prevention. *Int J Behav Nutr Phys Act* 2012;9:14.
62. Maes L, Van Cauwenberghe E, Van Lippevelde W et al. Effectiveness of workplace interventions in Europe promoting healthy eating: a systematic review. *Eur J Public Health* 2012; 22(5):677–683.
63. Marshall AL. Challenges and opportunities for promoting physical activity in the workplace. *J Sci Med Sport* 2004;7(1Suppl):60–66.
64. Matson-Koffman DM, Brownstein JN, Neiner JA et al. A site-specific literature review of policy and environmental interventions that promote physical activity and nutrition for cardiovascular health: what works? *Am J Health Promot* 2005;19(3):167–193.
65. McEachan RR, Lawton RJ, Jackson C et al. Testing a workplace physical activity intervention: a cluster randomized controlled trial. *Int J Behav Nutr Phys Act* 2011;8:29.
66. Merrill RM, Aldana SG, Garrett J et al. Effectiveness of a workplace wellness program for maintaining health and promoting healthy behaviors. *J Occup Environ Med* 2011;53(7):782–787.
67. Meyer P, Kayser B, et al. Stairs instead of elevators at workplace: cardioprotective effects of a pragmatic intervention. *Eur J Cardiovasc Prev Rehabil* 2010;17(5):569–575.
68. Morgan PJ, Collins CE et al. Efficacy of a workplace-based weight loss program for overweight male shift workers: the Workplace POWER (Preventing Obesity Without Eating like a Rabbit) randomized controlled trial. *Prev Med* 2011;52(5):317–325.
69. Neve M, Morgan PJ, Jones PR et al. Effectiveness of web-based interventions in achieving weight loss and weight loss maintenance in overweight and obese adults: a systematic review with meta-analysis. *Obes Rev* 2010;11(4):306–321.
70. Neville BH, Merrill RM, Kumpfer KL. Longitudinal outcomes of a comprehensive, incentivized worksite wellness program. *Eval Health Prof* 2011;34(1):103–123.
71. Ni Mhurchu C, Aston LM, Jebb SA. Effects of worksite health promotion interventions on employee diets: a systematic review. *BMC Public Health* 2010;10:62.
72. Nocon M, Muller-Riemenschneider F, et al. Review Article: increasing physical activity with point-of-choice prompts—a systematic review. *Scand J Public Health* 2010;38(6):633–638.
73. Osilla KC, Van Busum K, Schnyer C et al. Systematic review of the impact of worksite wellness programs. *Am J Manag Care* 2012;18(2):e68–81.
74. Ovbiosa-Akinbosoye OE, Long DA. Factors associated with long-term weight loss and weight maintenance: analysis of a comprehensive workplace wellness program. *J Occup Environ Med* 2011;53(11):1236–1242.
75. Pelletier KR. A review and analysis of the clinical and cost-effectiveness studies of comprehensive health promotion and disease management programs at the worksite: update VII 2004-2008. *J Occup Environ Med* 2009;51(7):822–837.
76. Pelletier KR. A review and analysis of the clinical and cost-effectiveness studies of comprehensive health promotion and disease management programs at the worksite: update VIII 2008 to 2010. *J Occup Environ Med* 2011;53(11):1310–1331.
77. Perez AP, Phillips MM, Cornell CE et al. Promoting dietary change among state health employees in Arkansas through a worksite wellness program: the Healthy Employee Lifestyle Program (HELP). *Prev Chronic Dis* 2009;6(4):A123.
78. Pratt CA, Lemon SC, Fernandez ID et al. Design characteristics of worksite environmental interventions for obesity prevention. *Obesity (Silver Spring)* 2007;15(9):2171–2180.

79. Pressler A, Knebel U, Esch S et al. An internet-delivered exercise intervention for workplace health promotion in overweight sedentary employees: a randomized trial. *Prev Med* 2010;51(3-4):234–239.
80. Proper KI, Staal BJ, Hildebrandt VH et al. Effectiveness of physical activity programs at worksites with respect to work-related outcomes. *Scand J Work Environ Health* 2002;28(2):75–84.
81. Robroek SJ, Polinder S, Bredt FJ et al. Cost-effectiveness of a long-term Internet-delivered worksite health promotion programme on physical activity and nutrition: a cluster randomized controlled trial. *Health Educ Res* 2012;27(3):399–410.
82. Robroek SJ, van Lenthe FJ, van Empelen P et al. Determinants of participation in worksite health promotion programmes: a systematic review. *Int J Behav Nutr Phys Act* 2009;6:26.
83. Scoggins JF, Sakumoto KN, Schaefer KS et al. Short-term and long-term weight management results of a large employer-sponsored wellness program. *J Occup Environ Med* 2011;53(11):1215–1220.
84. Siegel JM, Prelip ML, Erausquin JT et al. A worksite obesity intervention: results from a group-randomized trial. *Am J Public Health* 2010;100(2):327–333.
85. Soler RE, Leeks KD, Razi S et al. A systematic review of selected interventions for worksite health promotion. The assessment of health risks with feedback. *Am J Prev Med* 2010;38(2Suppl):S237–262.
86. Sorensen G, Linnan L, Hunt MK. Worksite-based research and initiatives to increase fruit and vegetable consumption. *Prev Med* 2004;39(Suppl2):S94–100.
87. Sternfeld B, Block C, Quesenberry CP Jr et al. Improving diet and physical activity with ALIVE: a worksite randomized trial. *Am J Prev Med* 2009;36(6):475–483.
88. Steyn NP, Parker W, Lambert EV et al. Nutrition interventions in the workplace: Evidence of best practice. *S Afr J Clin Nutr* 2009;22(3):11–117.
89. Strijk JE, Proper KI, van der Beek AJ et al. A worksite vitality intervention to improve older workers' lifestyle and vitality-related outcomes: results of a randomised controlled trial. *J Epidemiol Community Health* 2012;66(11):1071–1078.
90. Strijk JE, Proper KI, et al. A worksite vitality intervention for older hospital workers to improve vitality, work engagement, productivity and sick leave: results of a randomized controlled trial. *Scand J Work Environ Health* 2012;39(1):66–75.
91. Tamers SL, Beresford SA, Cheadle AD et al. The association between worksite social support, diet, physical activity and body mass index. *Prev Med* 2011;53(1–2):53–56.
92. Task Force on Community Preventive Services. A recommendation to improve employee weight status through worksite health promotion programs targeting nutrition, physical activity, or both. *Am J Prev Med* 2009;37(4):358–359.
93. Taylor WC, Shegog R, Chen V et al. The Booster Break program: description and feasibility test of a worksite physical activity daily practice. *Work* 2010;37(4):433–443.
94. Terry PE, Seaverson EK, Grossmeier J et al. Effectiveness of a worksite telephone-based weight management program. *Am J Health Promot* 2011;25(3):186–189.
95. Thorndike AN. Workplace interventions to reduce obesity and cardiometabolic risk. *Curr Cardiovasc Risk Rep* 2011;5(1):79–85.
96. Thorndike AN, Sonnenberg L, Healey E et al. Prevention of weight gain following a worksite nutrition and exercise program: a randomized controlled trial. *Am J Prev Med* 2012;43(1):27–33.
97. Thorsen AV, Lassen AD, Tetens I et al. Long-term sustainability of a worksite canteen intervention of serving more fruit and vegetables. *Public Health Nutr* 2010;13(10):1647–1652.
98. Touger-Decker R, Denmark R, Bruno M et al. *J Occup Environ Med* 2010;52(11):1112–1118.
99. Tucker SJ, Lanningham-Foster LM, Murphy JN et al. Effects of a worksite physical activity intervention for hospital nurses who are working mothers. *AAOHN J* 2011;59(9):377–386.

100. Vaughan-Jones H, Barham L, editor. Healthy work: challenges and opportunities to 2030. Bupa, 2009.
101. Vaughan-Jones H, Barham L. Healthy work: Evidence into action. Bupa, 2010.
102. Verweij LM, Coffeng J, van Mechelen W et al. Meta-analyses of workplace physical activity and dietary behaviour interventions on weight outcomes. *Obes Rev* 2011;12(6):406-429.
103. Viester L, Verhagen EA, Proper KI et al. VIP in construction: systematic development and evaluation of a multifaceted health programme aiming to improve physical activity levels and dietary patterns among construction workers. *BMC Public Health* 2012;12:89.
104. Vuillemin A, Rostami C, Maes L et al. Worksite physical activity interventions and obesity: a review of European studies (the HOPE project). *Obes Facts* 2011;4(6):479-488.
105. Warren BS, Maley M, Sugarwala LJ et al. Small Steps Are Easier Together: a goal-based ecological intervention to increase walking by women in rural worksites. *Prev Med* 2010;50(5-6):230-234.
106. WHO/World Economic Forum. Preventing non-communicable diseases in the workplace through diet and physical activity - WHO/World Economic Forum Report of a Joint Event. World Health Organization, 2008.
107. Wong JY, Gilson ND, van Uffelen JG et al. The effects of workplace physical activity interventions in men: a systematic review. *Am J Mens Health* 2012;6(4):303-313.
108. Yap TL, Davis LS, Gates DM et al. The effect of tailored E-mails in the workplace. Part I. Stage movement toward increased physical activity levels. *AAOHN J* 2009;57(7):267-273.
109. Yoon C, Jung H, Kim Y et al. Evaluation of an incentive-based obesity management program in a workplace. *Int J Occup Saf Ergon* 2011;17(2):147-154.

Appendices

Appendix 1: Tabulation of evidence used in the review

Appendix 2: Additional information pertaining to workplace interventions

Appendix 1: Tabulation of the relevant evidence papers

Table1. Legislative or regulatory interventions to decrease consumption of energy dense nutrient poor food and drinks, and/or increase consumption of vegetables and fruit

Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications arising from evidence
<p>(Ofcom 2010)</p> <p>Establish policy to restrict energy dense, nutrient poor food marketing, which reduces children's exposure to food marketing. For example UK statutory policy to ban marketing of food/drink high in fat and sugar at 'children's TV time'</p>	Children	Changes in exposure of high in fat, salt or sugar foods advertisements were tracked between 2005 (full year before regulations) and 2009 (first year in which restrictions were completely implemented)	<p>In 2009, no high in fat, salt or sugar foods were advertised in 'children's airtime'. This resulted in a decrease in children's exposure to high fat, salt or sugar food ads by 37% (compared to 2005)</p> <p>Transferrable to Australia</p>	<p>Follow up trial</p> <p>No control</p>	Restricting television advertisements in children's airtime has a modest impact on children's food preferences.
FOOD SUPPLY					
<p>(Steenhuis 2009)</p> <p>Reduction in portion size of packaged food/beverages – (Policy approaches are required as voluntary efforts by fast food companies to reduce portion sizes are unlikely to be effective, Young and Nestle 2007)</p> <p>Reduction of energy density in a product of the same size</p>	5 studies: 3 study populations were young and healthy population (College students)	Review	<ul style="list-style-type: none"> Portion size reduction of 25% resulted in a 10% decrease in energy intake (Rolls 2006) 25% reduction of energy density, with same portion size → led to a 24% decrease in energy intake (Rolls 2006) 		<p>Suggested interventions:</p> <ul style="list-style-type: none"> Target the selection of food, because once a larger portion is selected, over-consumption is very likely to occur. Standardised pricing—same value for money for small and large portions or discount on reasonable sized portions. (Feasible: O'Douherty 2006) Reformulation—Decreasing energy density of food products and meals, individuals are able to select the same/larger volume, while having less energy intake. (Consistent findings with Ello-Martin 2005, who found: individuals eating satisfying amounts

Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications arising from evidence
					<p>of low-energy-dense foods can help enhance satiety and control hunger while restricting energy intake)</p> <p>Interventions addressing portion distortion:</p> <ul style="list-style-type: none"> • Consumer education • Incentive for industry to reduce portion size • Educate restaurant chefs • Clear labeling of portion size (Feasible: Vermeer 2009) • Control portion size of packaged meals • Portion size requirements e.g. at schools
(Stroebele 2009) Calorie-controlled snacks (100kcal package)	59 participants: women and men aged between 18–65 years recruited through the University of Colorado Denver	59 participants randomly assigned 100kcal snacks (intervention) or standard size packaged of snacks for a week (control). Amount of snacks (g) consumed was recorded. Then groups swapped and amount of snacks consumed were recorded again	Participants that received the 100kcal snacks consumed an average of 186.9g less snacks per week. Additionally when those participants were given standard size snacks in week 2, the average amount of snacks consumed was 486.7g, compared to 675.75g high energy snacks consumed by week 1 participants, who were not exposed to the calorie-controlled snacks	Cross-over study, only 59 participants. Some promise (moderate gain, high uncertainty)	<p>Findings demonstrate that those who were exposed to the portion-controlled foods (100kcal) in the first week consumed less high energy snacks even when given the standard size food compared with the group who were not exposed to the portion-size foods</p> <p>Consumption of portion-controlled size snacks results in an overall decrease in the amount of energy-dense, nutrient poor foods consumed</p>

Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications arising from evidence
Food purchase					
Heart Foundation review of the evidence 2012 – Front-of-pack labeling, nutrition signposting, mandatory nutrition labeling and social marketing campaigns have resulted in positive food reformulation		Review	The Australian Heart Foundation Tick program has demonstrated a reduction of sodium and trans fat from commonly consumed foods (bread, breakfast cereals, sauces, processed meats, soups and margarines). 9622 tons of saturated fat was removed over an 8-year period from leading margarine products as a result of 2 companies committing to the Heart Foundation program		A mandatory approach to reformulating processed food has been shown to significantly shift a population's intake of sodium, saturated fat and trans fat from commonly consumed, processed foods. Although most initiatives rely on voluntary reformulation actions, the evidence demonstrates that greater outcomes can be achieved from legislating such initiatives. For example Australian modeling demonstrates that the impact from implementing mandatory sodium reformulation is 20 times greater than the potential health gains from a voluntary reformulation incentive program
(Vyth 2010) Nutrition signposting – Establishing front of pack nutrition labeling/ logo that indicates that the particular food is healthy and has met criteria, not only helps consumers make healthier decisions, but also encourages food companies to reformulate existing products or develop new food products with a healthier composition	47 food manufacturers (821 products) joining the Choices Foundation in Netherlands	47 food manufacturers that had joined the Choices Foundation were asked whether their Choices products were newly developed, reformulated or already meeting the Choices criteria	168 products out of 821 were reformulated to meet the Choices criteria 236 (out of 821) products were newly developed to meet the Choices criteria and carry the logo These resulted in new products with less salt, saturated fat, sugar and more fibre		The Choices logo has motivated food manufacturers to reformulate and develop new products with healthier composition Similarly, in New Zealand, the Pick the Tick logo effectively reduced the sodium content in some food products If food manufacturers are motivated to reformulate energy dense, nutrient poor foods to be lower in energy density or higher in nutrient value, people are still able to have the food but not be consuming energy dense, nutrient poor foods. In conjunction, the logos help

Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications arising from evidence
					decrease the consumption of energy-dense, nutrient poor foods by prompting consumers to choose the healthier option
(Sutherland 2010) Point of purchase nutrition navigation intervention, which involved a shelf-label 3-tiered star icon that reflected the food or beverages' nutritional quality		Natural experiment- data from 2006 and 2008 were obtained from a supermarket chain with 168 stores located in northern New England and New York	There was a small but significant increase in the proportion of products purchases with stars from 24.5% in 2006 (baseline) to 24.98% and 25.89% at the 1 and 2 year follow up An increase of 1.39% translates to a trade-off of approximately 2.9 million more items with stars being purchased monthly instead of products without stars		Effective supermarket point-of-purchase programs such as Guiding Stars nutrition navigation program that provides clear and simplified nutrition information to guide consumer choices is strongly required to decrease the consumption of energy dense, nutrition poor food and encourage intake of healthy choices
(Thow et al. 2010) Subsidies or taxes to encourage healthy eating. Taxes on energy dense, nutrient poor snack foods create a financial incentive for consumers to avoid them		24 reviews published between 2000 and 2009 (13 peer reviewed literature)	All 4 peer reviewed studies, which looked at the effect of a subsidy, or tax on food intake found that consumption altered in a positive and expected direction. A study by Jensen and Smed 2007 found younger consumers and lower-income groups changed their consumption most in response to taxes. It resulted in a decrease in sugar and saturated fat by 16% and 8% respectively, and increased consumption of fibre by 15%	Some promise	Imposing tax on energy dense, nutrient poor foods also stimulates food manufacturers to produce or reformulate healthier products to avoid the impost In addition, surveys conducted in the US show that the public is willing to cooperate with increased taxes if the funds generated are used to address childhood obesity The review by Thow et al. (2010) and study by Kim and Kawachi (2006) also suggests that food subsidies (i.e. on fruit and vegetables) should be used in conjunction with energy-dense, nutrient poor food taxes. This ensures tax on

Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications arising from evidence
					<p>energy-dense, nutrient poor foods does not have a detrimental effect and instead shifts consumption towards healthier alternatives</p> <p>Although the tax and subsidy interventions may be difficult to implement in Australia, due to differing tax systems and resistance from the food industry, the intervention can be implemented on a smaller scale. For example: employers in workplaces can subsidize fruit, vegetables and healthier choices</p>
Food accessibility					
<p>(Larson 2009)</p> <p>Policy action to improve geographic accessibility to supermarkets/farmers' markets/grocery stores in underserved areas</p>	Review		Residents with better access to supermarkets (and limited access to convenience stores) have lower levels or reduced risk of obesity, healthier diets and higher intake of fruit and vegetables		<p>Proposed strategies for improving access to healthy food include:</p> <ul style="list-style-type: none"> Strategies for attracting supermarkets to underserved neighborhoods (Needs assessment, financial incentives – fee waivers and tax abatements, provide shuttle services to stores and assist with parking, recruit residents for store jobs) Improve availability of fruits, vegetables and other healthy foods (Establish more farmers' or public market/grocery stores, develop community gardens, improve signage and shelf labels that identify healthful food choices, sell healthful foods at reduced prices, establish mobile

Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications arising from evidence
					<p>stores to deliver healthful products)</p> <ul style="list-style-type: none"> • Improve access to healthy foods at restaurants (Requirements for fast-food restaurants to be located a minimum distance from youth oriented facilities, limit total number of per capita fast-food restaurants in a community, improve identification and availability of healthful foods on menus, reduce prices of healthy foods, promote healthy foods at point-of-purchase)
<p>(Giang 2008, Lang 2009)</p> <p>Policy initiatives designed to improve supermarket access in underserved areas to increase healthy food access and availability</p>		<p>The Pennsylvania Fresh Food Financing Initiative helped build and refurbish super-markets in urban and rural areas of low-to-moderate-income across the state, to increase access to healthy food</p> <p>Similar initiatives were underway in other states such as New York, New Orleans, Louisiana and California (Karpyn 2012)</p>	<p>As a result, it was found that adding a supermarket to an underserved area improved the availability of a variety of healthy foods in the community (Goldstein 2008)</p>		

Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications arising from evidence
<p>(Wrigley 2003)</p> <p>Open up a large supermarket in an underserved area in Leeds, UK</p>	<p>Surveyed 276 people who switched to the new store</p> <p>Survey 339 people who did not switch to the new store</p>	<p>Pre and post survey interviews were used to measure how change in access to supermarkets affects the diet. Food intake was measure 5 months before the opening of the supermarket and 7 months after the opening of the supermarket</p>	<p>Statistically significant increase in fruit and vegetable intake in those who initially consumed the least amount of fruit and vegetable (at risk group)</p> <p>As a whole, those who switched to the new supermarket increased their consumption of fruit and vegetables by 0.23 portion each day. (Statistically significant at 5%)</p>		
<p>(Ayala 2009)</p> <p>Open up or improve small corner/ convenience/ grocery stores to offer more healthy options such as fruit and vegetables</p>		<p>2 tiendas stores selling fruit and vegetables were compared with 2 control group tiendas that did not offer fruit and vegetables (Gittelsohn 2009)</p>	<p>Customers who shopped at stores selling fruit and vegetables increased fruit and vegetable intake by 1 full serving compared to no difference in consumption in control group (Ayala 2009)</p>		<p>Improving existing small stores requires less time and cost than building a new supermarket in the community</p> <p>Strengthen community – builds relationships with local merchants and residents</p>
<p>(Nonas 2009)</p> <p>The New York City Healthy Bodega Initiative- Improve small stores or bodegas (grocery stores) in New York, by improving quality, quantity, display and distribution of fruit and vegetables. About 450 bodegas offered fruit and vegetables</p>			<p>Participating bodegas experienced increases in sales of fruit and vegetables. In addition, there were increases in the quantity, quality and variety of fresh products offered</p>		

Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications arising from evidence
<p>(Samia J, Pierce MW, Teret SP. The use of zoning to restrict fast food outlets: a potential strategy to combat obesity, 2005)</p> <p>Municipalities should adopt zoning laws to regulate the density and location of fast food outlets and promote healthier alternatives e.g. supermarkets</p>			<p>Although there have been many recommendations to use zoning strategies to decrease consumption of energy dense nutrient poor foods, there is no good-quality evaluation of the effect of zoning laws that reduce the density of fast food outlets in a particular area or restrict fast food restaurants within a specified distance from schools</p>		<p>According to the Centers for Disease Control and Prevention, the New York City Green Cart project used the existing zoning codes to create incentives for vendors who sell raw fruits and vegetables within the NYC limits. http://www.cdc.gov/phlp/winnable/zoning_obesity.html</p> <p>Additionally, other communities have excluded fast food and drive-through restaurants due to aesthetic zoning regulation, which indirectly reduces accessibility to fast food outlets and energy dense, nutrient poor foods (Davis JS 2008)</p>
<p>(Taber 2012)</p> <p>California schools- state laws governing fat, sugar and total calories of competitive foods sold in vending machines, schools stores and cafeterias</p>	<p>California and 14 states without high school food nutrition standards. 680 high schools sampled in February through May 2010</p>	<p>Cross-sectional study</p> <p>As part of the National Youth Physical Activity and Nutrition Study, nutrient intake assessed by 24-hour recall</p>	<p>On average, California students reported consuming less fat, sugar and 157.8 less total calories per day at school than students in states without any competitive food nutrition standards. Added sugar intake was 17.5g per day lower in California students than students of other states</p>	<p>Cross-sectional study – some promise</p>	<p>Reduce access to fast food and vending machines in schools</p>

Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications arising from evidence
(Jaime 2007) School based food and nutrition policies	Pre-schools, primary and secondary schools in Europe and US. Studies from Australia were found, however not included as they have not been evaluated or poorly evaluated	Review of 18 studies Randomised, non-randomised, controlled and non-controlled trials and cross-sectional studies conducted after the implementation of school-based nutrition policies, which had a non-exposed comparison group, were included. Studies up to November 2007 were included	The most effective interventions included implementing nutrition guidelines such as modification in school food service and nutrition education. The main message was to increase the availability of fruit, vegetables or healthy options and to reduce the amount of energy-dense, nutrient poor foods. 8 out of 9 interventions reported significant reduction in the consumption of total fat and saturated fat. 3 out of 4 interventions reported an increase in fruit and vegetable intake. Price interventions such as reducing the price or providing free fruit and vegetables were effective in increasing fruit and vegetable intake in 7 out of 8 studies	This review provides some promise (moderate gain, high uncertainty)	Regulation on unhealthy food and drink availability found a limited decrease in sales of unhealthy foods. In addition, Cullen et al. 2006 found that limiting the availability of snacks, chips, candy and sweetened beverages did result in a decrease in chips sold but sales of processed ice cream increased The review suggests that more evidence of effectiveness and studies of cost-effectiveness are required
(Robinson-O'Brien 2009) Incorporate garden-based nutrition- education into the school curriculums	Study participants ranged from 5–15 years	Reviewed 11 studies in the United States, published between 1990–2007: <ul style="list-style-type: none"> • 5 studies in school grounds • 3 studies in an afterschool program • 3 studies in a community setting 	Garden-based nutrition-education programs demonstrated potential improvements in fruit and vegetable intake, willingness to taste fruit and vegetable and increased preferences among youth who have low preferences for fruit and vegetables	Review of articles published in peer-reviewed journals. 5 out of 11 studies had an intervention group and control or comparison groups The results of the review provide some promise (moderate gain, high uncertainty)	Additionally McAleese and Rankin 2007 compared garden-based nutrition education with nutrition education only and control, and found significant increase in fruit and vegetable intake, fibre and vitamin A and C among garden+ nutrition education group compared to nutrition-education alone and control The study recommends that schools should consider integrating garden-based nutrition education into the curriculum, as research suggests garden-

Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications arising from evidence
					based education may also lead to improved academic achievement
<p>(Engbers 2005)</p> <p>Worksite environmental changes such as improving the availability of fruit, vegetable and healthy choices in worksite, healthy food labeling and efficient placement. Establish policies that require more healthy choices available and restrict the amount of less healthy options</p>		13 studies in the literature review up until 2004 January. Studies include randomised controlled trials or high quality controlled trials	With the support of general promotional material, environmental modifications such as providing or expanding the availability of fruit, vegetables and health choices in vending machines and work cafeterias, healthy food labeling and efficient placements in the worksite were found to be effective in 6 out of 9 studies at increasing fruit and vegetable intake	Some promise	<p>The review suggests positive dietary intake (increase fruit and vegetable intake and decrease fat intake), can be influenced by food labeling, promotional materials (brochures), expanding availability of healthy products and efficient food placements</p> <p>Findings of this review are supported by trials that use relatively simple environmental modifications exclusively, such as placing point of purchase signs in vending machines, price strategies and expanding healthy product selections resulted in an increase in sales of healthier products. (French et al. 1997, French et al. 2001 and Jeffery et al. 1994)</p>

References in Endnote:

1. Cullen KW, Watson K, Zakeri I et al. Exploring changes in middle-school student lunch consumption after local school food service policy modifications. *Public Health Nutr* 2006;9(6):814–820.
2. Engbers LH, van Poppel MN, Chin APMJ et al. Worksite health promotion programs with environmental changes: a systematic review. *Am J Prev Med* 2005;29(1):61–70.
3. French SA, Jeffery RW, Story M et al. Pricing and promotion effects on low-fat vending snack purchases: the CHIPS Study. *Am J Public Health* 2001;91(1):112–117.
4. French SA, Jeffery RW, Story M et al. A pricing strategy to promote low-fat snack choices through vending machines. *Am J Public Health*. 1997;87(5):849–851.
5. French SA, Story M, Jeffery RW et al. Pricing strategy to promote fruit and vegetable purchase in high school cafeterias. *J Am Diet Assoc* 1997;97(9):1008–1010.
6. Gittelsohn J, Rowan M, Gadhoke P. Interventions in small food stores to change the food environment, improve diet, and reduce risk of chronic disease. *Prev Chronic Dis* 2012;9:E59.
7. Gittelsohn J, Song HJ, Suratkar S et al. An urban food store intervention positively affects food-related psychosocial variables and food behaviors. *Health Educ Behav* 2010;37(3):390–402.
8. Harnack LJ, French SA, Oakes JM et al. Effects of calorie labeling and value size pricing on fast food meal choices: results from an experimental trial. *Int J Behav Nutr Phys Act* 2008;5:63.
9. Herrera NM. Eating right: the consumption of fruits and vegetables. New York: Nova Science Publishers, 2011.
10. Jaime PC, Lock K. Do school based food and nutrition policies improve diet and reduce obesity? *Prev Med* 2009;48(1):45–53.
11. Jeffery RW, French SA, Raether C et al. An environmental intervention to increase fruit and salad purchases in a cafeteria. *Prev Med* 1994;23(6):788–792.
12. Jensen JD, Smed S. Cost-effective design of economic instruments in nutrition policy. *Int J Behav Nutr Phys Act* 2007;4:10.
13. Karpyn A, Young C, Weiss S. Reestablishing healthy food retail: changing the landscape of food deserts. *Child Obes* 2012;8(1):28–30.
14. Larson NI, Story MT, Nelson MC. Neighborhood environments: disparities in access to healthy foods in the U.S. *Am J Prev Med* 2009;36(1):74–81.
15. Laska MN, Borradaile KE, Tester J et al. Healthy food availability in small urban food stores: a comparison of four US cities. *Public Health Nutr* 2010;13(7):1031–1035.
16. McAleese JD, Rankin LL. Garden-based nutrition education affects fruit and vegetable consumption in sixth-grade adolescents. *J Am Diet Assoc*. 2007; 107(4):662–665.
17. O'Dougherty M, Harnack LJ, French SA et al. Nutrition labeling and value size pricing at fast-food restaurants: a consumer perspective. *Am J Health Promot* 2006;20(4):247–250.
18. Robinson-O'Brien R, Story M, Heim S. Impact of garden-based youth nutrition intervention programs: a review. *J Am Diet Assoc* 2009;109(2):273–280.
19. Rolls BJ, Roe LS, Meengs JS. Reductions in portion size and energy density of foods are additive and lead to sustained decreases in energy intake. *Am J Clin Nutr* 2006;83(1):11–17.
20. Sharma S, Cao X, Arcan C et al. Assessment of dietary intake in an inner-city African American population and development of a quantitative food frequency questionnaire to highlight foods and nutrients for a nutritional intervention. *Int J Food Sci Nutr* 2009;60(Suppl5):155–167.
21. Steenhuis IH, Vermeer WM. Portion size: review and framework for interventions. *Int J Behav Nutr Phys Act* 2009;6:58.
22. Stroebele N, Ogden LG, Hill JO. Do calorie-controlled portion sizes of snacks reduce energy intake? *Appetite* 2009;52(3):793–796.
23. Sutherland LA, Kaley LA, Fischer L. Guiding stars: the effect of a nutrition navigation program on consumer purchases at the supermarket. *Am J Clin Nutr* 2010;91(4):1090–1094S.
24. Vermeer WM, Steenhuis IH, Seidell JC. From the point-of-purchase perspective: a qualitative study of the feasibility of interventions aimed at portion-size. *Health Policy* 2009;90(1):73–80.

25. Vyth EL, Steenhuis IH, Roodenburg AJ et al. Front-of-pack nutrition label stimulates healthier product development: a quantitative analysis. *Int J Behav Nutr Phys Act* 2010;7:65.
26. Wrigley N, Warm D, Margetts B. Deprivation, diet, and food- retail access: findings from the Leeds 'food deserts' study. *Environment and Planning* 2003;35:151–188.
27. Young LR, Nestle M. Portion sizes and obesity: responses of fast-food companies. *J Public Health Policy* 2007;28(2):238–248.

References not found in Endnote:

1. Nonas C. New York City: Healthy food access. 2009. In: *The Public Health Effects of Food Deserts: Workshop Summary*. Washington (DC): National Academies Press, 2009. Available from: <http://www.nap.edu/catalog/12623.html>.
2. Ayala GX, Baquero B, Linnan L et al. Working with tiendas to promote healthy eating. In: *The Public Health Effects of Food Deserts: Workshop Summary*. Washington DC: National Academies Press, 2009. Available from: <http://www.nap.edu/catalog/12623.html>
3. Ver Ploeg M, Breneman V, Farrigan T et al. Access to Affordable and Nutritious Food: Measuring and Understanding Food Deserts and their Consequences. Report to Congress. US Department of Agriculture: Ch 8: Policy Options, June 2009.
4. Gittlesohn J. Overview of Efforts to Change the Food Environment. Washington DC: Presentation at the OIM/NRC Workshop on the Public Health Effects of Food Deserts, January 27, 2009.
5. Lang B, Manon M. Stimulating supermarket development: a new day for New York. Philadelphia: The Food Trust, 2009.
6. Goldstein I, Loethen L, Kako E et al. CDFI financing of supermarkets in underserved communities: a case study. Philadelphia: The Reinvestment Fund, 2008.
7. Giang T, Karpyn A, Laurison HB et al. Closing the grocery gap in underserved communities: the creation of the Pennsylvania Fresh Food Financing Initiative. *J Public Health Manag Pract* 2008;14(3):272–279.
8. Fear T, Gibbons C, Anderson S. The Heart Foundation's 'Tick' Program. Driving innovation for a healthier food supply. *Food Australia* 2004; 56(12):599–600.
9. Heart Foundation. Rapid review of the evidence. Effectiveness of food reformulation as a strategy to improve population health. 2012. Available from: https://www.heartfoundation.org.au/SiteCollectionDocuments/RapidReview_FoodReformulation.pdf
10. Davis JS, Fast Food, Zoning, and the Dormant Commerce Clause: Was It Something I Ate? 35 B.C. *Envtl Af L Rev* 259 [Internet] 2008. Available from: <http://lawdigitalcommons.bc.edu/ealr/vol35/iss2/4>
11. Mair JS, Pierce MW, Teret SP. The use of zoning to restrict fast food outlets: a potential strategy to combat obesity, 2005.

Table 2. Reviews of changes to the physical environment and physical activity

Article	Description of intervention	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications arising from evidence
1, 2	<p>Guide to Community Preventive Service's methods for systematic reviews, CDC (US)</p> <p>Environmental and Policy Approaches to Increase Physical Activity: Community-Scale Urban Design Land Use Policies</p>	Systematic review (12 studies)	<p>Environment-relevant strategies included:</p> <ul style="list-style-type: none"> • Environment changes indoors: "point-of-decision" prompts to encourage stair use and community-wide campaigns) • Environmental/policy intervention: creation of or enhanced access to places for physical activity combined with informational outreach <p>Overall, median improvement in some aspect of PA (e.g. number of walkers or bicyclists) was 161%</p> <p>Additional <i>potential</i> benefits that may have been brought about by these interventions included:</p> <ul style="list-style-type: none"> • Improvements in green space • Increased sense of community • Increased consumer choice for places to live • Reduced crime and stress 	Very promising	In 2004, the Community Preventive Services Task Force recommended design and land use policies and practices that support physical activity in urban areas of several square miles or more based on sufficient evidence of effectiveness in facilitating an increase in physical activity
3	Review of multiple interventions	Systematic review (physical activity and academic-related search terms)	There is substantial evidence that physical activity can help improve academic achievement, including grades and standardised test scores. This review suggests that physical activity can have an impact on cognitive skills and academic performance, enhanced concentration and attention, improved classroom behaviour	Promising	<p>Increasing or maintaining time dedicated to physical education may help, and does not impact, academic performance</p> <p>Promising at local or state level; US schools should strive to meet (US) National recommendations for daily physical education and includes school opportunities for daily PA</p>

Article	Description of intervention	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications arising from evidence
4	Review of multiple interventions	Literature review	<p>School health efforts that are high quality, strategically planned, and effectively coordinated are one of the best investments for influencing the health, as well as the minds, of the nation's youth</p> <p><i>{note this is also recommended in the & best investments for physical activity globally, produced by GAPA, and republished in Br J Sports Med, 2012}</i></p>	Promising	<p>Prioritising educational outcomes may enhance the acceptability of physical activity in school to policy makers, teachers and other stakeholders</p> <p>Limitation: emphasis is on urban minority youth, health factors were selected based, in part, on feasibility of implementing proven or promising school-based programs and services</p>
5, 6	Environmental and Policy Approaches to Increase Physical Activity: Creation of or Enhanced Access to Places for Physical Activity Combined with Informational Outreach Activities	Systematic Review (10 papers)	<p>Ten studies qualified for the review, all focused on creating or enhancing access to places for PA; shown effective in getting people to exercise more</p> <ul style="list-style-type: none"> • Aerobic capacity: median increase of 5.1% (i/q range: 2.8% - 9.6%; 8 study arms); • Energy expenditure: median increase of 8.2% (i/q range -2.0% to 24.6%; 3 study arms) • % reporting some leisure-time PA: median increase of 2.9% (i/q range: -6.0% to 8.5%; 4 study arms) • Exercise score: median increase 13.7% (i/q range -1.8% to 69.6%; 6 study arms) 	Very promising	<p>In May 2001, The Community Preventive Services Task Force recommended the creation of or enhanced access to places for physical activity based on strong evidence of their effectiveness in increasing physical activity and improving physical fitness</p> <p><i>Note that some of these programs provided training with health behaviour change, referrals to physicians or health and fitness programs, in addition to a 'place' to be active</i></p> <p><i>These interventions were effective in diverse settings, and if adapted to target populations, should be applicable to diverse groups.</i></p>

Article	Description of intervention	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications arising from evidence
7	Environmental and Policy Approaches to Increase Physical Activity: Street-Scale Urban Design Land Use Policies	Systematic Review (6 studies)	<p>Overall, median improvement in some aspect of PA (e.g., # walkers or % active individuals) was 35%</p> <p>Additional potential benefits of these interventions included:</p> <ul style="list-style-type: none"> • Improvements in green space • Increased sense of community • Reductions in crime and stress 	Very promising	The CDC Preventive Services Task Force recommends urban design and land use policies that support PA in small geographic areas based on sufficient evidence of their effectiveness in increasing physical activity. However, increased urban walking/cycling, although beneficial, also pose risks of increased injury
8	Environmental and Policy Approaches to Increase Physical Activity: Point-of-Decision Prompts to Encourage Use of Stairs	Systematic Review (11 studies)	<p>In 10 of the 11 studies reviewed more people used the stairs when point-of-decision prompts were posted. Stair use during the intervention period in these study arms ranged from 4.0% to 41.9% of potential users</p> <p>Review showed stair use increased by median of 2.4% (i/q range 0.83% to 6.7%; 21 study arms)</p> <p>Findings from several of the studies suggest that tailoring the prompts to describe specific benefits or to appeal to specific populations may increase stair intervention effectiveness</p> <p>This intervention appears effective in shopping malls, train stations, office buildings, University settings and libraries, Schools of Public Health, and hospitals</p>	Promising	<p>The Community Preventive Services Task Force recommends point-of-decision prompts on the basis of evidence of effectiveness in increasing the % of people choosing to take the stairs</p> <p>Insufficient studies to determine if stairwell enhancements (e.g., paint, carpet, art, signs, and music) increased effectiveness</p> <p><i>Update Note from author: there are a total of >40 studies now in this area, two published meta analyses, three systematic reviews, and a sequential meta analysis in press. Despite this evidence base, translation is rudimentary, with few examples of scaling up of this [evidenced] environmental strategy in the community</i></p>

Article	Description of intervention	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications arising from evidence
9	Updated Summary of reviews on correlates of PA and the environment [adults] (Bauman, Lancet 2012)	Summary of review papers	Systematic Review of review papers, including cross sectional and longitudinal studies	Mostly cross sectional evidence <i>[case studies in text of intervention examples]</i>	Some reviews identified neighbourhood design aspects, walkability and street connectivity as correlates of transport-related activity; leisure time PA consistently related to transportation environment [footpath and safety of crossings]; aesthetic variables (e.g. greenness and attractiveness) ; and proximity to recreation facilities. Total PA related to recreation facilities and locations, transportation environment, and aesthetics. No consistent environmental correlates of PA among older adults identified
10	Summary of correlates of PA and the environment in children, adolescents (Ding 2011)	Summary review of 103 primary studies	Review of all papers examining the relationship between PA and the built environment for children and adolescents	Most cross-sectional correlational evidence Very limited population intervention evidence	For children and adolescents, most consistent associations were from objectively measured environmental characteristics. The strongest correlates for children were walkability, traffic speed, and volume (inversely), land use mix (proximity of homes, destinations such as shops), residential density, and access or proximity to recreation facilities. Land-use mix and residential density were stronger correlates for adolescents

References for Table 2

1. Kahn EB, Ramsey LT, Brownson RC et al. The effectiveness of interventions to increase physical activity. A systematic review. *Am. J. Prev. Med* 2002; 22(4 Suppl):73–107
2. Heath GW, Brownson RC, Kruger J et al. The effectiveness of urban design and land use and transport policies and practices to increase physical activity: a systematic review. *Journal of Physical Activity and Health* 2006; 3(Suppl1):S55–S76.
3. National Center for Chronic Disease Prevention and Health Promotion. Healthy youth! Student health and academic achievement. [Internet] 2010 [cited November 2012]. Available from: http://www.cdc.gov/healthyyouth/health_and_academics/index.htm#3
4. Basch CE. Healthier students are better learners: a missing link in school reforms to close the achievement gap. *J Sch Health*. 2011;81:593–598.
5. Task Force on Community Preventive Services. [Recommendations to increase physical activity in communities](#). *Am J Prev Med* 2002;22 (4S):67–72.
6. CDC. [Increasing physical activity. A report on recommendations of the Task Force on Community Preventive Services](#). *MMWR* 2001; 50 (RR–18):1–16.
7. Guide to Community Preventive Services. Environmental and policy approaches: street-scale urban design and land use policies [Internet] 2004 [cited November 2012]. Available from: www.thecommunityguide.org/pa/environmental-policy/streetscale.html

Table 3. Evidence summary active transport

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
1	To evaluate the effectiveness of a program to increase walking to and from school using A two-year multi-component program included classroom activities, development of school Travel Access Guides, parent newsletters and improving environments with local councils	1996 students aged 10–12 years and their parents. From 24 primary public schools in inner west Sydney, Australia	A survey completed by students on how they travelled to and from school over five days, and a survey completed by their parents on how their child travelled to and from school in a usual week	The percentage of students who walked to and from school increased in both the intervention and control schools. Data from parent surveys found that 28.8% of students in the intervention group increased their walking, compared with 19% in the control group (a net increase of 9.8%, $p=0.05$). However this effect was not evident in the student data	The study produced a mixed result, with a high variation in travel patterns from school to school	Intervention research should address the complexity of multiple factors influencing student travel to school with a focus on changing local environments and parents' travel to work
2	To assess the contribution of active travel to and from school to children's overall physical activity levels in England	4,468 children aged 5–15 years (303 with valid accelerometry data) participating in the nationally-representative Health Survey for England 2008	Logistic regression models examining associations between active travel (walked, or cycled, to/from school at least once in the last week) and achievement of physical activity recommendations (≥ 60 min/d daily)	<p>The 64% of children who walked and the 3% who cycled to/from school were more active than the 33% who did neither. Typical walkers came from a deprived area and were less likely to have a limiting illness; typical cyclists were older, male, and most likely to meet the recommendations</p> <p>For self-reported activity, time spent cycling to/from school contributed more to meeting the recommendations (OR1.31, 1.09–1.59) than time spent walking to/from school (OR1.08, 1.02–1.15) or in sports (OR1.17, 95% CI 1.14–1.20). Time spent walking to school (OR1.80, 1.41–2.30) and in sports (OR1.10, 1.01–1.20) were significantly associated with</p>	A cross-sectional study, hence limited in quality; could try other study type	Longitudinal studies are required to ascertain whether encouraging active travel affects less active children

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
				being in the highest tertile actigraph-measured activity		
3	Predictors of Increases Among Children and Adolescents, Social factors and physical environmental characteristics were the most important predictors of active commuting in children and adolescents, respectively	Participants were 121 children (aged 9.1□0.34 years in 2004) and 188 adolescents (aged 14.5□0.65 years in 2004) from Melbourne, Australia	Participants were initially recruited and assessed in 2001. Follow-up data were collected in 2004 and 2006 and analysed in 2008	Children whose parents knew many people in their neighborhood were more likely to increase their active commuting (OR=2.6; CI=1.2, 5.9; p=0.02) compared with other children. Adolescents whose parents perceived there to be insufficient traffic lights and pedestrian crossings in their neighborhood were less likely to increase their active commuting over 2 years (OR=0.4; CI=0.2, 0.8; p=0.01), whereas adolescents of parents who were satisfied with the number of pedestrian crossings were more likely to increase their active commuting (OR=2.4; CI=1.1, 5.4; p=0.03) compared with other adolescents	No mention of study type, but assume it is a longitudinal study, hence strength is limited	Further studies should also look into the role the parent's play in the children's mode of travel Future studies should also examine predictors of walking and cycling separately. Findings from the present study suggest that future strategies to improve rates of active commuting to school should consider the role of neighborhood social networks and physical characteristics, particularly in relation to pedestrian infrastructure
4	Barriers, facilitators and interventions to get more Australians physically active through cycling	Australians	N/a	Possible interventions to increase number of Australians cycling	N/a	Campaigns, programs and urban design
5	Using a randomised controlled trial design, this study assessed the impact of a 12-week graduated pedometer-based walking intervention on daily step-counts, self-reported physical	Sixty-three women and 16 men (49.2 years ± 8.8) were randomly assigned to either an intervention (physical activity consultation and 12-week pedometer-	Measures for step-counts, 7-day physical activity recall, affect, quality of life (n=79), body mass, BMI, % body fat, waist and hip circumference (n=76), systolic/diastolic blood pressure, total	Significant increases were found in the intervention group for step-counts ($p < .001$), time spent in leisure walking ($p=.02$) and positive affect ($p=.027$). Significant decreases were found in this group for time spent in weekday ($p=.003$), weekend ($p=.001$) and total sitting ($p=.001$) with no corresponding changes in the control group. No significant changes in any other health outcomes were found in	Study design is an RCT, hence very good in terms of strength	Continued follow-up of this study will examine adherence to the intervention and possible resulting effects on health outcomes

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
	activity and health outcomes in a Scottish community sample not meeting current physical activity recommendations	based walking program) or control (no action) group	cholesterol and HDL cholesterol ($n=66$) were taken at baseline and week 12. Analyses were performed on an intention to treat basis using 2-way mixed factorial analyses of variance for parametric data and Mann Whitney and Wilcoxon tests for non-parametric data	<p>either group. In comparison with the control group at week 12, the intervention group reported a significantly greater number of minutes spent in leisure time ($p=.008$), occupational ($p=.045$) and total walking ($p=.03$), and significantly fewer minutes in time spent in weekend ($p=.003$) and total sitting ($p=.022$)</p> <p>A pedometer-based walking program, incorporating a physical activity consultation, is effective in promoting walking and improving positive affect over 12 weeks in community based individuals. The discussion examines possible explanations for the lack of significant changes in health outcomes</p>		
6	Assess what interventions are effective in promoting a population shift from using cars towards walking and cycling and to assess the health effects of such interventions	N/a	Systematic search and appraisal to identify experimental or observational studies with a prospective or controlled retrospective design that evaluated any intervention applied to an urban population or area by measuring outcomes in members of the local population	<p>22/5660 studies met the inclusion criteria. We found some evidence that targeted behaviour change programs can change the behaviour of motivated subgroups, resulting (in the largest study) in a shift of around 5% of all trips at a population level. Single studies of commuter subsidies and a new railway station also showed positive effects</p> <p>The balance of best available evidence about publicity campaigns, engineering measures, and other interventions suggests that they have not been effective. Participants in trials of active commuting experienced short term improvements in certain measures of health and fitness</p>	Systemic review, did thorough search hence good strength of evidence	Evaluate other types of intervention as well

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
7	Determine what interventions are effective in promoting cycling, the size of the effects of interventions, and evidence of any associated benefits on overall physical activity or anthropometric measures		Searched 13 electronic databases, websites, reference lists, and existing systematic reviews, and papers identified by experts in the field	Twenty five studies (of which two were randomised controlled trials) from seven countries were included. Six studies examined interventions aimed specifically at promoting cycling, of which four (an intensive individual intervention in obese women, high quality improvements to a cycle route network, and two multifaceted cycle promotion initiatives at town or city level) were found to be associated with increases in cycling. Those studies that evaluated interventions at population level reported net increases of up to 3.4 percentage points in the population prevalence of cycling or the proportion of trips made by bicycle. Sixteen studies assessing individualised marketing of “environmentally friendly” modes of transport to interested households reported modest but consistent net effects equating to an average of eight additional cycling trips per person per year in the local population. Other interventions that targeted travel behaviour in general were not associated with a clear increase in cycling. Only two studies assessed effects of interventions on physical activity; one reported a positive shift in the population distribution of overall physical activity during the intervention	Systemic review, did thorough search hence good strength of evidence	Increase cycling by modest amounts, but further controlled evaluative studies incorporating more precise measures are required, particularly in areas without an established cycling culture
8	<i>N/a- a review</i>	Selected cities in Netherlands, Denmark, Germany, UK, Canada, US and Australia (2000–2005)	Number of bike trips	The key to achieving high levels of cycling appears to be the provision of separate cycling facilities along heavily travelled roads and at intersections, combined with traffic calming of most residential neighbourhoods. Extensive cycling rights of way in the Netherlands,	Covered many countries and compared between them	Implementation of this multi-faceted, mutually reinforcing set of policies that best explains the success of these three countries in promoting cycling

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
				Denmark and Germany are complemented by ample bike parking, full integration with public transport, comprehensive traffic		
9	Whether increased cycling affected both mortality and morbidity	Working-age population of Copenhagen	Change in burden of disease (measured as disability-adjusted life years (DALY)) due to changed exposure to the health determinants physical inactivity, air pollution (particulate matter <2.5 mm) and traffic accidents	Increase in cycling could reduce the burden of disease in the study population by 19.5 DALY annually. This overall effect comprised a reduction in the burden of disease from health outcomes associated with physical inactivity (76.0 DALY) and an increase in the burden of disease from outcomes associated with air pollution and traffic accidents (5.4 and 51.2 DALY, respectively)	Used a quantitative HIA but did not account for potential confounders	<p>We did not have knowledge on the exact injury outcomes but calculated the burden of disease from accidents based on WHO's estimate of burden of disease from road traffic accidents, which also includes a diverse mix of outcomes, and the relative distribution of traffic accidents involving different road users and vehicles in Denmark. We, thus, assumed equal outcome severity from bicycle and car accidents</p> <p>Our results and the methods applied have certain limitations, which points towards future research questions. These include further development of methods for quantitative HIAs and how to better include social and psychological health effects in quantitative assessments. Other important research areas relate more specifically to transportation and the systemic nature of transport. This includes a specific need for further</p>

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
						research on accidents and the association between numbers of cyclists and risk of accidents and also the wider implications of transport such as effects on climate change, access to goods and services and social connection in communities
10	Effect of repealing mandatory bicycle helmet legislation on the frequency of cycling in Sydney	Participants were 600 residents aged 16 years and older, done via quota sampling	Primary outcome measures were propensity to cycle more if a helmet was not required, how often a respondent who cycled would cycle without a helmet, and opinion on compulsory wearing of bicycle helmets. Frequency of cycling, and demographic questions	One in five (22.6%, 95% CI 18.8–26.4%) respondents said they would cycle more if they did not have to wear a helmet, particularly occasional cyclists (40.4% of those who had cycled in the past week and 33.1% of those who had cycled in the past month). Almost half (47.6%) of respondents said they would never ride without a helmet, 14.4% said 'all the time', 30.4% said 'some of the time' and the rest were not sure. One third (32.7%, 95% CI 28.5–37.0%) of respondents did not support mandatory helmet legislation	A cross sectional, a stronger study type could have been employed	Further research is needed to understand how helmet legislation deters people from cycling. There are anecdotal reports that some people do not ride at all because of helmets, or cannot be bothered with some trips. Even more important is the negative image of cycling as a dangerous activity that helmet legislation engenders

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
11	To explore barriers and facilitators to using CityCycle, a public bicycle share scheme in Brisbane, Australia	Focus groups: Group one consisted of infrequent and non- cyclists (no bicycle riding over the past month), group two were regular bicycle riders (ridden a bicycle at least once in the past month) and group three was composed of CityCycle members	Thematic analytic method was used to analyse the data. Three main themes were found: Accessibility/spontaneity, safety and weather/topography.	<p>The lengthy sign-up process was thought to stifle the spontaneity typically thought to attract people to public bike share. Mandatory helmet legislation was thought to reduce spontaneous use. Safety was a major concern for all groups and this included a perceived lack of suitable bicycle infrastructure, as well as regular riders describing a negative attitude of some car drivers. Interestingly, CityCycle riders unanimously perceived car driver attitudes to improve when on CityCycle bicycles relative to riding on personal bicycles</p> <p>In order to increase the popularity of the CityCycle scheme, the results of this study suggest that a more accessible, spontaneous sign-up process is required, 24/7 opening hours, and greater incentives to sign up new members and casual users, as seeing people using CityCycle appears critical to further take up</p>	Qualitative studies can be quite subjective, hence qualitative study might have been a better approach	Further research is required to investigate driver attitudes to PBSS, to improve understanding of the apparent change in driver behaviour to public bikes, and to determine whether such a phenomenon is restricted to Brisbane, Australia
12	The meta-analysis of bicycle helmet efficacy reported by Attewell, Glase, and McFadden (Accident Analysis and Prevention 2001, 345–352) was influenced by publication bias and time-trend bias that was not controlled for	N/a	Reanalysis of Attewell, Glase, and McFadden (Accident Analysis and Prevention 2001	The analysis reported inflated estimates of the effects of bicycle helmets	Meta-analysis	Results were different to studies of similar nature

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
13	Do mandatory bicycle helmet laws deliver a net societal health benefit?	N/a	Using a simple model. The model recognises a single health benefit—reduced head injuries—and a single health cost—increased morbidity due to foregone exercise from reduced cycling	A (positive) net health benefit emerges only in dangerous bicycling environments under optimistic assumptions as to the efficacy of helmets and a minor behavioural response	An analysis only	N/a
14	Improving health through policies that promote active travel is thought to control obesity, limit chronic disease, and reduce air pollution emissions, including greenhouse gasses	N/a	Review available literature regarding health impacts from policies that encourage active travel in the context of developing health impact assessment (HIA) models to help decision-makers propose better solutions for healthy environments	Policies that increase active travel are likely to generate large individual health benefits through increases in physical activity for active travelers. Smaller, but population-wide benefits could accrue through reductions in air and noise pollution. Depending on conditions of policy implementations, risk tradeoffs are possible for some individuals who shift to active travel and consequently increase inhalation of air pollutants and exposure to traffic injuries. Well-designed policies may enhance health benefits through indirect outcomes such as improved social capital and diet, but these synergies are not sufficiently well understood to allow quantification at this time	Review of evidence only	Limitation of the Woodcock and de Hartog studies is the lack of consideration of how policies act to change behaviours and how optimal policy scenarios can be developed. Policies typically come in bundles (e.g. bike lane network+tree canopies+traffic calming measures) Assessing such ‘packages’ may not only represent a more realistic view of policy processes but also allow considerations of further co-benefits beyond changes in PA and air pollution
15	Assess the influence of bike paths and lanes, which have been the main approach to increasing cycling in	N/a	Statistical analysis : multiple regression and model	Role of bike paths and lanes do not control for the many other differences among cities in their approaches to encourage cycling. Intersection improvements and priority traffic signals for cyclists, bike parking, coordination	Cross-sectional analysis, quite detailed and used good statistical analysis to support findings	Cannot be used to predict changes over time none of our models can prove causality. Analysis is also limited by its reliance on aggregate, city-level data, which mask variations

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
	the US			with public transport, traffic education and training, and bike promotion and public awareness campaigns all influence cycling levels to some extent		within cities, among neighborhoods, and individuals Results do not permit conclusions about individual travel behaviour
16	Evaluate whether the TravelSmart program is effective in changing the dominance of car travel in Perth	WA population	Evaluating the TravelSmart program	Overall, MJA concludes the Local Government program is a valuable program, which is cost-effective from the WA Government's point of view The Workplace program is achieving excellent impacts in terms of VKT reductions associated with major trip generators in the Perth metropolitan area	Evaluation report	Both programs have room for improvement and can potentially yield even greater VKT reductions and community benefits through some minor modifications and the adoption of M&E plans, along the lines suggested in this report, which will allow ongoing fine tuning of the programs

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
17	Looking at the Eddington Transport Study's role in make 'Better Use' of the existing transport network in meeting national strategic objectives	N/a	Review of the Eddington's study	The scheme was considered to have made a positive contribution to one or more of the DfT strategic goals. In particular, many evaluations presented benefits relating to: 'tackling climate change'; 'supporting economic growth'; and, 'better safety, security and health'	External review, hence not biased, research also quite in-depth Overall this review of evaluations of Better Use schemes revealed some shortcomings that limit the usefulness of the current evidence base as an input for the generation and appraisal of policy options	Some of the key shortcomings of the evaluation evidence have already been outlined, especially in terms of its breadth, depth and detail. Full evaluations carried out to a high standard are desirable, but will not always be practical or affordable. The schemes and areas where the evidence base would most benefit from further focused and full evaluations (e.g. commissioned by DfT) to fill key evidence gaps are outlined below Focus on scheme types, especially ones that affect car use and ones yet to be evaluated i.e. cycle pool and improve on DfT objectives
18	Understanding of the relationship between chronic disease and climate change should enable improved policy formulation to support both human health and the health of the planet	N/a	N/a provides recommendations	Take home message about co-benefits is that low carbon ways of living are healthy ways of living	Information bulletin	Take home message about co-benefits is that low carbon ways of living are healthy ways of living and health professionals should be promoting them
19	To investigate the effect of a workplace	University of Bristol Staff Travel Surveys	Usual mode of commuting, gender, age,	The percentage of respondents who reported that they usually walked to work increased	Cross-sectional study	These analyses take the form of a series of cross-sectional

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
	travel plan, that mainly focused on restricting parking opportunities, on levels of active commuting and its potential to contribute to public health		worksite location and distance commuted to and from work were obtained from staff and statistically analysed	<p>from 19.0% to 30.0% (Z 1/4 4.24, P < 0.001). The percentage of regular cyclists increased from 7.0% to 11.8%, but this was not statistically significant. In 2007, regular walkers were more likely to be female, under 35 years of age and earning a middle-band salary. Regular cyclists were more likely to be male, aged 36e45 years and earning a higher-band salary</p> <p>Approximately 70% of respondents who usually walked or cycled to work achieved greater than 80% of the recommended guidelines for physical activity through their active commuting</p>		<p>survey comparisons, so change within individuals cannot be established. The survey response rate was just less than 50%</p> <p>The absence of a control or comparison group means that it is not possible to be sure that implementation of the Transport Plan caused the change in commuting patterns</p> <p>Furthermore, the authors have been unable to find any other substantive local infrastructure change or campaign within the survey period that was sufficiently powerful and relevant to travel to the University that may provide an alternative explanation for the results</p>
20	Aims to highlight the benefits to health of developing a sustainable transport environment where active travel and public forms of transport represent realistic, efficient and safe alternatives to	N/a	UK population	Many of the health harms associated with the transport environment can be mitigated with policy action	Report compiled by BMA	<p>Need to re-focus transport policy in the UK to improve health and well-being</p> <p>Transport policy should aim to reduce congestion and improve the usability of roads by pedestrians and cyclists through reallocation of road space, restricting motor vehicle access,</p>

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
	travelling by car					<p>road-user charging schemes, and traffic-calming and traffic management (including area-wide 20 miles per hour speed limits)</p> <p>There should be further development of, and incentives for, alternatives to traditional car usage patterns such as workplace car sharing schemes and car clubs</p>
21	Modifying transport infrastructure to support active travel (walking and cycling) could help to increase population levels of physical activity	Cambridge population, specifically adults (16+) who travel to work in Cambridge	Using repeated postal questionnaires and basic objective measurement of physical activity using accelerometers; in-depth quantitative studies of physical activity energy expenditure, travel and movement patterns and estimated carbon emissions using household travel diaries, combined heart rate and movement sensors and global positioning system (GPS) receivers; and a longitudinal qualitative interview study			<p>One challenge is that of effectively combining different disciplinary perspectives on the research problems</p> <p>A second challenge is that of implementing robust quantitative measurement of travel and physical activity behaviour in the context of an unpredictable and frequently changing intervention timetable which is completely outside the researchers' control structure will also be the subject of a further paper</p> <p>A third challenge is that of analysing a cohort dataset with repeated and varying measures of both exposures and outcomes</p>

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
22	Car travel is the most dominant, we aim to change that by putting limitations in the workplace, i.e. limited parking or offering incentives for not driving	Employees in workplaces targeted for implementation of workplace travel plan	Implementation of this workplace travel program	Some employers have offered incentives to encourage commuting by travel alternatives, e.g. gift vouchers if a target is met. Some have also reduced or proposed charges for employee car parking and commuter use of fleet vehicles	Report, but based in Australia alone, could be expanded to include other areas for comparison	A challenge for TravelSmart is working out how best to manage the existing employers in the programs as well as continue to expand in the future. Demonstrating the business benefits of travel plans and finding ways to integrate implementation into good human resource, fleet and facility management will be important in mainstreaming travel plans. Further evaluation of changes in employee travel behaviour as well as organisational practices will aid future development of workplace travel plans in Australia
23	What enables cycling and safe cycling behaviours	Sydney residents	Survey/questionnaire	Route knowledge, legitimacy, employer support	Program/ strategy plan	Environment must be suitable and supportive of cycling, make it stand out and sociable, participatory and inclusive for everyone
24	Assesses the potential benefits of increased walking and reduced obesity associated with taking public transit in terms of dollars of medical costs saved and disability avoided	US households	Use of a daily travel diary in which household respondents were asked to self-report all trips, their purposes, starting and ending times, and the means of transportation during an assigned travel day	<p>Taking public transit is associated with walking 8.3 more minutes per day on average, or an additional 25.7–39.0 kcal</p> <p>It is estimated that an increase in net expenditure of 100 kcal/day can stop the increase in obesity in 90% of the population. Additional walking associated with public transit could save \$5500 per person in present value by reducing obesity-related medical</p>	Cross sectional study, could have done an RCT for this intervention instead of relying on data from other studies	Future studies can look at: how to entice an individual to switch from car commuting to public transit, how to extend public transportation into underserved areas, and how high the marginal costs of these activities are relative to these potential marginal benefits

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
				costs. Savings in quality-adjusted life years could be even higher		
25	Summarises evidence published on the impact of public transport on the health of populations	Australian population	HIA survey searches of Web of Science and Scopus databases	The potential health benefits of public transport are created mainly through the access it provides to the material resources and services needed for good health. Public transport has the potential to contribute to improved social inclusion for low-income and outer urban households as well as for individuals who have mobility problems due to age or disability. It enables people to travel to work, education, health care, and to participate in a variety of social and recreational activities	Review, could use more search engines	Review indicates a lack of research in either the disciplines of public health or transport planning that focuses on the health effects, including health inequalities, of public transport
26	Can increased provision of transit service and policy incentives that favor transit use support a physically active lifestyle?	Atlanta residents Recruitment was stratified based on income, household size, and the net residential density of neighborhoods to produce a statistically representative sample of households living in distinctly different built environments	SMARTAQ travel survey in metropolitan Atlanta, Georgia (in 2001–2002)	Very little met the recommended amount of PA using walking Found a positive association between public transit trips and meeting the physical activity recommendation by using walking for transportation. For car trips (as a driver), this relationship was negative. Having and using an employer-sponsored transit pass was also associated with meeting the physical activity recommendation when compared with both non-walkers and moderate walkers	Cross sectional study, this type of study is not RCT feasible	Atlanta has a low transit mode share and therefore our sample consisted of few transit users and few individuals with access to an employer-sponsored transit pass Most people living in low-density environments where little to no transit service is provided

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
27	The role of Urban planning in physical activity and nutrition	N/a	N/a	Recommendations based on evidence and interventions	A review of evidence and interventions	The influence of many specific interventions is not known, partly due to the lack of meaningful evaluations. Health impacts of many projects are not assessed, either routinely or even on an ad hoc basis, especially transport and urban projects
28	Creating healthy environments to allow uptake of PA	NSW population	Recommendations	Key environmental features that contribute to increased physical activity and prevention of weight gain include: <ul style="list-style-type: none"> • Mixed land use • Housing density • Footpaths and cycleways and facilities for physical activity • Street connectivity and design • Transport infrastructure and systems, linking residential, commercial and business areas 	Overview report, a brief overview of what has been done only	
29	Does healthy urban environments can encourage healthy living?	N/a	N/a	The built environment can promote active living through design elements such as: » suburbs and neighbourhoods that people find interesting and easy to walk around » key facilities such as schools, shops, parks and public transport » provision of walking and cycling facilities (e.g. footpaths and cycleways) » facilities for physical activity (e.g. swimming pools) » activity centres with a variety of uses » transport infrastructure and systems (including	Set of guidelines, limited in level of evidence	N/a

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
				public transport) linking housing to jobs in commercial and business areas		
30	The role of the built environment and the promotion of PA in children	American children	N/a	The studies suggest that the built environment has a facilitative role in promoting child physical activity	Cross sectional study	Produce and promote laws and regulations, provide space for active living , fund research in this area
31	How environmental factors and policies are related to young people's physical activity and sedentary behavior patterns, and how these in turn may be linked to obesity	American children	N/a	Active kids need more safe places to play Neighborhoods can promote active living Physical activity environments at school Better safety means increased physical activity Reducing screen time makes more time for physical activity	Research summary, quite powerful as research was conducted	There is strong evidence linking access to facilities like parks, playgrounds and recreation programs with increased physical activity and reduced risk for obesity among kids Schools can offer many opportunities for children to be physically active, including effective PE programs, updated playgrounds, well-maintained equipment and supervised activity breaks throughout the school day
32	The role of Walking and Biking to School, Physical Activity and Health Outcomes	N/a	N/a	Walkers generally more physically active Those who cycled had greater cardiorespiratory fitness	Research summary	N/a
33	Making the Link from Transportation to Physical Activity and Obesity	N/a	N/a	People who used public transportation (i.e. subways, commuter rails, light rails, buses, trolleys, etc.) for any reason were less likely to be sedentary or obese than adults who did not use public transportation	Research summary	Beyond improving local travel options, transportation infrastructure investments that support physical activity can result in increased recreational opportunities, improvements to

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
				Proximity to public transit stops was linked to higher transit use and higher levels of physical activity among adults		<p>individuals' health and decreased health care costs</p> <p>Programs that raise awareness and complement pedestrian and bicycle facilities are promising options for supporting physical activity</p>
34	Use TravelSmart Workplace program to reduce car trips generated by their workplaces	Employees and employers in Perth	Surveys	<p>A review of 13 workplaces found that nine (69%) recorded a reduction in the proportion of commute trips made solo as car driver</p> <p>The average relative reduction was 10 per cent. In most workplaces this mode shift was reflected in greater public transport and carpool commuting</p>	A magazine article based on prior established program, opinions expressed may be a bit biased	Challenges for the program include sustaining and mainstreaming workplace travel demand management whilst scaling up coverage across the metropolitan region
35	How effective is cycling as transport in a public health approach?	Europe	A systematic literature review of experimental or observational studies that objectively evaluated the effect of the built environment on cycling	Environmental factors identified as being positively associated with cycling included presence of dedicated cycle routes or paths, separation of cycling from other traffic, high population density, short trip distance, proximity of a cycle path or green space and for children projects promoting 'safe routes to school'. Negative environmental factors were perceived and objective traffic danger, long trip distance, steep inclines and distance from cycle paths	Systemic review, collects and analyses similar studies and identifies the strengths and weaknesses for relevant studies	<p>Not many of these interventions and factors mentioned have been evaluated</p> <p>There is a need for further development of innovative research designs to bridge the evidence gap in population-level interventions supporting cycling</p>
36	Effectiveness of a workplace travel plan	NZ working population	N/a	The recommendations are all based on creating a supporting environment and having incentives for undertaking active travel over car travel	Fact sheet of suggested actions /recommendations	Ref to doc for full list of recommendations

	Description of intervention	Description of study population	Study methods	Study findings	Quality/ Level of evidence	Recommendations or implications
37	The importance of community design (town planning) in creating a walkable community.	N/a	N/a	<ul style="list-style-type: none"> • Proximity and connectivity create walkable neighborhoods • Walkable neighborhoods mean more trips via foot and bicycle • Design changes encourage activity indoors • Walkable neighborhoods encourage active living 	Research summary	N/a

Table 4A. Summary of reviews of interventions to increase physical activity and improve diet (and weight outcomes) in and via the workplace

Reference	Review description	Description of the included literature and outcomes	Review findings	Comments
<p>Chan and Perry (2012)</p> <p><i>Lifestyle health promotion interventions for the nursing workforce: a systematic review</i></p>	<p>Systematic review</p> <p><i>Inclusion criteria:</i></p> <ul style="list-style-type: none"> Working age-nurses Behavioural interventions: <ul style="list-style-type: none"> BMI, Diet, PA Smoking Hazardous drinking Included an uncontrolled trial <p>Jan 2000 to Dec 2011</p> <p>n=3</p>	<p>Outcomes of behavioural interventions were either changes in risk factor indices or related morbidity or mortality</p> <p>Methodological features were described using the CONSORT checklists; risk of bias was assessed using the Cochrane Handbook classification</p>	<p>Fewer cigarettes smoked during the intervention period, down from mean (SD) 20 (8) to 12 (9) per day ($p<0.001$)</p> <p>Significantly reduction in fat mass (0.68 vs. 0.07 kg; $p=0.028$)</p> <p>Significant gains across a battery of fitness assessments</p> <p>The paucity of work focused on nurses' health behaviours was the important finding</p>	<p>Only 3 studies included, all from outside of Australia</p> <p>All 3 studies were considered to have limitations and high risk of bias</p>
<p>Kahn-Marshall et al. (2012)</p> <p><i>Making healthy behaviours the easy choice for employees: a review of the literature on environmental and policy changes in worksite health promotion</i></p>	<p>(Systematic) Review</p> <p><i>Inclusion criteria:</i></p> <ul style="list-style-type: none"> Peer-reviewed articles between 1995–2010 Interventions involving environmental modifications or policy changes to the worksite to impact on PA or nutrition <p>n=27 articles</p>	<p>Two categories of intervention were identified:</p> <ol style="list-style-type: none"> those involving changes to the worksite policy or environment only (n=11) those that <i>also</i> included individually-focused strategies for changing employee behaviours (multicomponent, MC) (n=16) <p>n=1 policy change only n=10 environment only</p>	<p>Overall moderate evidence for the effectiveness of MC programs using environmental and/or policy changes in addition to individual-level strategies on improving F&V intake, fat intake and PA</p> <ol style="list-style-type: none"> Inconclusive evidence for worksite and/or policy only. Overall the nutrition-focused environmental interventions were of a relatively low cost to implement and showed a positive effect on dietary behaviours (although methodologically poor) Strongest evidence for MC interventions involving environment + PA + nutrition (n=9) 	<p>Most included studies were methodologically poor (n=10 RCTs)</p> <p>Those MC interventions that included an individual-focus were generally of higher quality; particularly those focused on both nutrition and PA</p> <p>The environmental and policy-only studies that attempted to increase PA levels did not use</p>

Reference	Review description	Description of the included literature and outcomes	Review findings	Comments
		n=4 policy + other strategies n=2 MC environment + individual PA	3/5 studies reported significant increases in F&V 3/4 that aimed to decrease BMI, produced significant results	many self-report variables, and therefore relied on observational measures or infrared monitors to measure physical activity levels
Kaspin et al. (2012) <i>Systematic review of employer-sponsored wellness strategies and their economic and health-related outcomes</i>	Systematic review Searched multiple databases and an industry magazine for English-language articles <i>Inclusion criteria:</i> Articles reporting characteristics of employer-sponsored wellness programs and their impact on health-related and economic outcomes among US employees 2005 to 2011 n=20	Economic, clinical, and patient-related outcomes associated with employer-sponsored wellness programs Specific outcomes of interest: Health-related outcomes including practice of healthy behaviours (e.g. exercise) No information provided on how PA was measured in most studies	Increased exercise and two other health-related outcomes (risk reduction and smoking cessation) was the outcome reported most often across articles Decreases in health risk factors (e.g. inadequate exercise) were observed	American studies only Unrealistic to assume that all employers have the funds available to sponsor wellness strategies Publication bias noted Only 3 studies in peer reviewed journals, with no systematic reviews or randomised trials identified; most included articles were case studies Few studies assessed outcomes between employees who did and did not participate in the wellness program
Maes et al. 2012 <i>Effectiveness of workplace interventions in Europe promoting</i>	Systematic review <i>Inclusion criteria:</i> • European countries • Worksite-based interventions	17 studies solely focusing on promotion of a healthy diet: • 8 educational • 1 environmental change • 8 combination of both	There is only moderate evidence of effect of educational and multi-component dietary interventions on dietary behaviours and potential dietary determinants of such behaviours • Moderate evidence for effective interventions to improve diet (none of the identified studies were rated	European studies only Effects of workplace health promotion interventions may be improved if stronger adherence to established

Reference	Review description	Description of the included literature and outcomes	Review findings	Comments
<i>healthy eating: a systematic review</i>	<p>promoting a healthy diet solely or in combination with PA</p> <ul style="list-style-type: none"> • Anthropometrical or behavioural change • Adults (≥18 years) <p>1 Jan 1990 to 1 Oct 2010</p> <p>n=30</p>	<p>13 studies focusing on both nutrition and PA:</p> <ul style="list-style-type: none"> • 9 educational • 4 multi-component studies <p>Used a standardised tool for the assessment of the quality of the study design (from The European Network for Workplace Health Promotion)</p>	<p>as strong in quality; 7 met the criteria for ‘moderate’ quality</p> <p>Combined nutrition and PA interventions showed less positive results:</p> <ul style="list-style-type: none"> • 13 studies focusing on both nutrition and PA indicated inconclusive evidence for effects – 10 studies weak and 3 studies moderate quality (no strong quality) <p>Could not conclude that any of the types of interventions consistently produced effects on body composition</p>	<p>quality criteria for such interventions is realised</p> <p>Publication bias noted</p> <p>Unidentified effects on weight status could be due to a lack of studies in general and high quality studies in particular</p>
<p>Wong et al. (2012)</p> <p><i>The effects of workplace physical activity interventions in men: a systematic review</i></p>	<p>Systematic review</p> <p><i>Inclusion criteria:</i></p> <ul style="list-style-type: none"> • Peer-reviewed articles • Healthy working men, with studies included if women also but findings for men reported separately • Workplace interventions that aimed to increase PA or improve health <p>Up to October 2010</p> <p>n=14 (based on 13 interventions)</p>	<p>Interventions that aimed to:</p> <ul style="list-style-type: none"> • Increase PA or improve health, WITH • PA as a primary or secondary outcome measure <p>n=7, targeting a range of behaviours and associated outcomes through generic strategies that combined PA promotion with smoking cessation and weight and stress management</p> <p>n=4, focused exclusively on PA strategies and behaviour measurement</p> <p>n=5, studies used theoretical framework to guide their intervention</p>	<p>2 studies reported no change in men’s PA</p> <p>6 studies reported non-significant increases using intervention strategies that included:</p> <ul style="list-style-type: none"> • Encouragement to do free-choice PA • An education program and a self-supervised fitness program • PA counselling • Print materials <p>5 reported significant increase in PA</p> <ul style="list-style-type: none"> • 3 of these studies used a theoretical framework • 4 of these studies were RCT’s or controlled trials • Intervention strategies varied widely and tended to be part of multicomponent approaches targeting a range of health behaviours 	<p>Men only</p> <p>Publication bias noted</p> <p>Few workplace PA interventions that have reported data for men</p> <p>Of the 5 studies which showed significant increase in PA, they used a variety of:</p> <ul style="list-style-type: none"> • Timeframes • Self-report PA measures • PA outcomes <p>Findings suggest evidence base limited by:</p> <ul style="list-style-type: none"> • Small number of studies • Key methodological concerns

Reference	Review description	Description of the included literature and outcomes	Review findings	Comments
<p>Archer et al. (2011)</p> <p><i>Promising practices for the prevention and control of obesity in the worksite</i></p>	<p>Systematic review</p> <p><i>Inclusion criteria:</i></p> <ul style="list-style-type: none"> Conducted at a worksite Designed for adults (≥ 18 years) Reported weight-related outcomes <p>01.01.66 – 31.12.05</p> <p>n=136</p>	<p>16 policy and environment studies</p> <p>46 informational and educational strategies</p> <p>80 behavioural strategies</p>	<p>Identified 6 promising practices with evidence to suggest that they have demonstrated a reduction in a weight-related outcome or prevalence of individuals who are overweight or obese:</p> <p><i>Policy and environment:</i></p> <ol style="list-style-type: none"> Enhanced access to opportunities for PA combined with health education <p><i>Informational and educational:</i></p> <ol style="list-style-type: none"> Exercise prescription (planned or structured PA regime) alone Multi-component educational practices (e.g. health education session plus an exercise or nutrition prescription) <p><i>Behavioural:</i></p> <ol style="list-style-type: none"> Weight loss competitions and incentives (in kind or financial) Behavioural practices (e.g. goal setting) with incentives (in kind or financial) Behavioural practices without incentives 	<p>Unable to identify the strength of evidence of effectiveness for one promising practice over another because of the heterogeneity between studies (weight outcome and design) and the number of studies available within each strategy</p> <p>These practices should be tested by worksites and warrant further evaluation by the research community</p>
<p>Barr-Anderson et al. (2011)</p> <p><i>Integration of short bouts of physical activity into organisational routine</i></p>	<p>Systematic review</p> <p><i>Inclusion criteria:</i></p> <ul style="list-style-type: none"> Peer-reviewed sources School-, worksite- or faith-based Brief exercise bouts as single or primary PA intervention (3–20 minutes) 	<p>Short bouts PA were generally 10–15 minutes in length</p> <p>75% of worksite studies used RCT design</p> <p>Studies focused on broad range of outcomes including work performance, mental health, clinical disease risk indicators as well as PA – only a quarter of</p>	<p>Generally modest but significant improvements with regard to PA</p> <p>Inconsistent findings regarding physiological outcomes (BMI, blood pressure, waist circumference or fitness measures). Mixed results on work performance outcomes effects</p> <p>Promising evidence to support the effectiveness of short bouts of PA on the accumulation of meaningful amounts of daily PA</p>	<p>Schools were the most common setting for these studies</p> <p>Only 3 studies measured PA in worksites so evidence is limited</p>

Reference	Review description	Description of the included literature and outcomes	Review findings	Comments
	1960 to July 2010 n=12 worksite-based	worksite studies assessed PA		
Brown et al. (2011) <i>Does physical activity impact on presenteeism and other indicators of workplace well-being?</i>	Review <i>Inclusion criteria:</i> <ul style="list-style-type: none"> • Included some form of PA as a study variable • Workplace setting • Available in hard copy or full text; not in a clinical or treatment population Search conducted in November 2009 (no limits indicated) n=20	13 intervention trials 7 observational trials	Many types of PA have a positive impact on employee well-being, across a wide range of outcome measures No association in intervention trials between PA and absenteeism Insufficient evidence to show an association between PA and coping, organisational commitment or physical satisfaction Limited evidence between PA and presenteeism due to wide variation in how studies conceptualised and assess presenteeism	PA was not main outcome

Reference	Review description	Description of the included literature and outcomes	Review findings	Comments
<p>Hutchinson et al. (2011)</p> <p><i>Improving nutrition and physical activity in the workplace: a meta-analysis of intervention studies</i></p>	<p>Meta-analysis</p> <p><i>Inclusion criteria:</i></p> <ul style="list-style-type: none"> • Included a workplace intervention • Control group included • Health, and in particular diet, nutrition or PA included as outcome measures • Adequate statistical information • Published studies (not studies which only included high-risk individuals) <p>1999 to March 2009</p> <p>n=29</p>	<p>Interventions grouped according to the theoretical framework on which the interventions were based, e.g.</p> <ul style="list-style-type: none"> • Education • Cognitive-behavioural • Motivation enhancement • Social influence • Exercise <ul style="list-style-type: none"> • Papers were only included in 'education' if they were not included in any other category because nearly all of the interventions included an educational component • Studies allocated to 'exercise' if the intervention consisted of exercise only in the absence of any theoretical approach 	<p>Most theoretical approaches were associated with small effects</p> <p>Large effects were found for some measures of interventions using motivation enhancement</p> <p>Effect sizes were larger for studies focusing on one health behaviour and for RCT's</p>	<p>Aspects of motivational enhancement such as motivational interviewing and the use of rewards or incentives should be incorporated into future programs</p>

Reference	Review description	Description of the included literature and outcomes	Review findings	Comments
<p>Jensen (2011)</p> <p><i>Can worksite nutritional interventions improve productivity and firm profitability? A literature review</i></p>	<p>Systematic review</p> <p><i>Inclusion criteria:</i></p> <ul style="list-style-type: none"> Not stated (excluded if topic was not relevant) <p>Dates searched not stated</p> <p>n=30</p>	<p>Studies included randomised controlled or quasi-experimental worksite intervention trials and observational cross-sectional studies.</p> <p>A quality appraisal of the studies was based on study design and clarity in definition of interventions, as well as environmental and outcome variables</p>	<p>Some evidence for positive productivity effects of worksite interventions aimed at making employees diets healthier</p> <p>Worksite interventions may be capable of increasing daily intake of fruit and vegetables by 0.3-0.5 servings and the intake of dietary fibres by 1-2%, and of reducing fat intake by 1–10%</p>	<p>Improving diet was an intermediate outcome of the review</p>
<p>Chau et al. (2010)</p> <p><i>Are workplace interventions to reduce sitting effective? A systematic review</i></p>	<p>Systematic review</p> <p><i>Inclusion criteria:</i></p> <ul style="list-style-type: none"> Interventions to increase energy expenditure (increase PA or decrease sitting time) Workplace setting Specifically measured sitting as an outcome Papers written in English, Chinese, Dutch, French, German, Italian, Norwegian or Spanish checked for eligibility <p>Up to March to April 2009</p>	<p>Two independent reviewers assessed methodological quality of the included studies using a quality rating list adapted from the Delphi list</p> <p>All 6 studies had increasing PA as a primary aim and reducing sitting as a secondary aim</p> <p>All studies targeted participants at the individual level using a mix of approaches:</p> <ul style="list-style-type: none"> 3/6 offered individually tailored PA advice or counselling 1/6 involved PA counselling plus fitness-testing 1/6 sent weekly healthy eating and active living email messages 	<p>No studies showed that sitting decreased significantly in the intervention group, compared with a control or comparison group</p>	<p>In most papers samples did not appear to be representative of the general population (most involved middle aged, well-educated female volunteers with access to email or internet)</p> <p>Quality ratings indicated several methodological limitations in the included studies</p> <p>The ability to detect changes in sitting may have been compromised by selection of measurement instruments for assessing sitting</p> <p>Main limitation is the small number of studies included</p>

Reference	Review description	Description of the included literature and outcomes	Review findings	Comments
	n=6 (5 RCTs and one pre-post study)	<ul style="list-style-type: none"> 1/6 promoted walking using pedometers, motivational emails, suggested walking routes, hints on increasing incidental walking 		
Groeneveld et al. (2010) <i>Lifestyle-focused interventions at the workplace to reduce the risk of cardiovascular disease: a systematic review</i>	Systematic review <i>Inclusion criteria:</i> <ul style="list-style-type: none"> RCT or controlled trial that 1) targeted workers; 2) aimed at increasing PA and/or diet; and 3) measured body weight, body fat, blood pressure, blood lipids and/or blood glucose 1 January 1987 and 21 December 2008 n=31 (All RCTs)	The three intervention strategies most frequently used were individual counselling (N=18), group education (N=15), and supervised exercise (N=11) Other methods, such as general written advice, a prescribed diet, self-help materials, environmental changes, or monetary incentives, were investigated only sporadically	No evidence for a positive effect of workplace lifestyle focused interventions on body weight, blood pressure, serum lipid profile, blood glucose and triglycerides. Strong evidence for positive effect on overall body fat. Strong evidence in high-risk population for an effect on body weight	To gain better insight into the mechanisms that led to the intervention effects, the participants' compliance with the intervention and the lifestyle changes achieved should be reported in future studies
Ni Mhurchu et al. (2010) <i>Systematic review on the financial return of worksite health promotion programmes aimed at improving nutrition and/or increasing physical activity</i>	Review <i>Inclusion criteria:</i> <ul style="list-style-type: none"> Peer-reviewed literature Worksite health promotion studies with dietary outcomes (minimum study duration of 8 weeks) 	8 focused on employee education 8 focused on changing the worksite environment (alone or in combination with education)	Worksite health promotion programs are associated with moderate improvement in dietary intake	Quality of studies has been frequently poor, with the majority of studies relying on self-reported food intake

Reference	Review description	Description of the included literature and outcomes	Review findings	Comments
	1994 to April 2009 n=16 studies			
Nocon et al. (2010) <i>Increasing physical activity with point-of-choice prompts: a systematic review</i>	Systematic Review <i>Inclusion criteria:</i> • Point of-choice interventions to promote stair climbing Articles from previous review Kahn et al. (1980 to 2000) and from Jan 2001–May 2008 n=25	5 studies conducted in office buildings 1 in a university 9 in a shopping mall 8 in bus/train stations 1 in a hospital 1 in a library	Most studies reported an increase in stair climbing after an intervention with point-of-choice prompts when the alternative is an escalator (e.g. in shopping centres), while the majority of elevator settings (i.e. workplaces) did not find significant changes	Positive effects may not be generalisable to every workplace setting (usually no escalators, in tall office buildings lifts rather than escalators; too many stairs?) The size of the effect varied and so a one-size fits all solution is not feasible
Verweij et al. (2010) <i>Meta-analyses of workplace physical activity and dietary behaviour interventions on weight outcomes</i>	Meta-analysis <i>Inclusion criteria:</i> • RCTs targeting PA and/or dietary behaviour of employees and reported any weight-related outcome 1980 to Nov 2009 n=43 studies	26 studies focused on PA and diet, 14 on PA only and 3 on diet only	Moderate quality of evidence that workplace PA and diet behaviour interventions significantly reduce body weight, BMI and body fat percentage Low quality of evidence that workplace PA interventions significantly reduce body weight and BMI. Effects on body fat could not be properly investigated due to lack of studies. Subgroup analyses showed greater reduction in body weight of PA and diet interventions containing an environmental component	Environmental component likely to be essential to ensuring maximal outcomes

Reference	Review description	Description of the included literature and outcomes	Review findings	Comments
<p>Anderson et al. (2009)</p> <p><i>The effectiveness of worksite nutrition and physical activity interventions for controlling employee overweight and obesity</i></p>	<p>Systematic review</p> <p><i>Inclusion criteria:</i></p> <ul style="list-style-type: none"> • Worksite health promotion programs with strategies involving diet, PA or both • Provided data on at least one weight-related outcome measured at least 6 months from baseline <p>Up to Dec 2005</p> <p>n=47 studies</p>	<p>Half of the studies were from the US</p> <p>Most of the studies combined informational and behavioural strategies to influence diet and physical activity; fewer studies modified the work environment (e.g., cafeteria, exercise facilities) to promote healthy choices</p>	<p>Strong evidence that workplace interventions aimed at improving nutrition, PA or both have a modest effect on weight, and that this is applicable to men and women in a range of workplace settings</p> <p>Limited evidence to suggest differential program effects by program focus (nutrition, PA or both) or program components (information, behavioural skills, environmental, policy), but more or more intensive intervention components appeared to increase program effects</p>	<p>Multi-component programs are more effective</p> <p>Insufficient evidence on different population groups; limited generalisability</p> <p>More research needed on economic efficiency of programs</p>
<p>Robroek et al. (2009)</p> <p><i>Determinants of participation in worksite health promotion programmes: a systematic review</i></p>	<p>Systematic review</p> <p><i>Inclusion criteria:</i></p> <ul style="list-style-type: none"> • Studies that reported quantitative information on determinants of participation <p>1988 to 2007</p> <p>n=23</p>	<p>10 studies (education or counselling)</p> <p>6 studies (fitness centre intervention)</p> <p>7 studies (multi-component programs)</p>	<p>Women are more likely than men to participate in educational and multi-component workplace programs.</p> <p>Programs that provide incentives and multi-component interventions are most likely to attract participants</p> <p>Interventions that target multiple behaviours attract more participants than interventions that only target PA</p>	<p>Incentives and multicomponent programs are effective and likely to have highest reach</p>

Reference	Review description	Description of the included literature and outcomes	Review findings	Comments
Steyn et al. (2009) <i>Nutrition interventions in the workplace: evidence of best practice</i>	Systematic review <i>Inclusion criteria:</i> <ul style="list-style-type: none"> Peer-reviewed articles on workplace interventions in healthy populations Focus was on the search for nutrition-based interventions Jan 1995 to July 2006 from studies evaluated in a WHO report n=30	Outcome measures: <ul style="list-style-type: none"> Changes in nutritional knowledge, attitudes, self-efficacy, intentions and stage of change Changes in dietary behaviours Changes in clinical/physical markers, such as: body weight or body-mass index (BMI) Blood pressure (BP) or serum cholesterol concentrations Process and/or policy outcomes Quality and feasibility of studies was evaluated (quality assessment instrument was adapted from Pomerleau et al.)	A large number of diverse workplace interventions were successful in changing outcomes positively. The following were key success factors: <ul style="list-style-type: none"> There was a nutrition and PA component Dietitians were involved in nutrition education Changes occurred in the cafeteria/canteen, which increased the availability and advertising of healthy food options Tailored feedback on diet (and clinical values) given Employees involved in planning and managing programs Reduced prices (of healthy food items) in vending machines encouraged employees to buy healthier options Stages of change theory was most commonly associated with best practice outcomes Note: quality rating of studies was: <ul style="list-style-type: none"> 9 high 13 medium 8 low 	Included studies were all outside of Australia It is necessary to plan intervention programs based on existing evidence of best practice

Reference	Review description	Description of the included literature and outcomes	Review findings	Comments
<p>Bellew (2008)</p> <p><i>Primary prevention of chronic disease in Australia through interventions in the workplace setting: An Evidence Check rapid review brokered by the Sax Institute</i></p>	<p>Review</p> <p>Inclusion criteria:</p> <ul style="list-style-type: none"> Health promotion, health education, worksite wellness, chronic disease prevention Systematic reviews, meta-analytic reviews, non-systematic reviews and single studies Reports with information about study details, aim, population(s) involved, and main conclusions <p>Jan 1996 to Jun 2008</p> <p>n=16 systematic reviews, 100 additional studies</p>	<p>29% of studies were about nutrition, 31% were about PA, 6% dealt with chronic disease or >1 risk factor</p> <p>100 additional studies: 29% of studies were about nutrition, 31% were about PA, 6% dealt with chronic disease or >1 risk factor</p>	<p>Strong to definitive evidence for effectiveness PA interventions with the following strategies:</p> <ul style="list-style-type: none"> Prompts to increase stair use; access to places and opportunities for PA Education, employee and peer support Multi-component interventions combining nutrition and PA Strong to definitive evidence for effectiveness of nutrition interventions using the following strategies: Multi-component interventions that include PA and nutrition (e.g. nutrition education, dietary prescription, behavioural skills development and training to control adult overweight, obesity) Improved access to and availability of nutritious foods Promotional strategies at point-of-purchase Found strong to definitive evidence that comprehensive or multi-component programs were effective for reducing individual risk for high risk employees 	<p>Majority of papers from North America and Europe</p> <p>In many cases, study subjects for whom the WHP interventions 'worked' were self-selecting so that interventions proven to be 'effective' in the context of research trials may encounter many barriers in a subsequent 'real world' implementation process</p>
<p>Benedict and Arterburn (2008)</p> <p><i>Worksite-based weight loss programs: a systematic review of recent literature</i></p>	<p>Systematic review</p> <p>Worksite programs where body weight was assessed before and after intervention</p> <p>At least 8 weeks duration</p>	<p>11 RCTs identified, most of which focused on education and counselling to improve diet and increase PA</p> <p>Follow-up ranged from 2 to 18 months</p>	<p>Overall methodological quality poor</p> <p>Intervention groups lost significantly more weight than controls, with the mean difference in weight loss ranging from -0.2 to -6.4 kg</p>	<p>Long-term data on health and economic outcomes lacking</p> <p>There is a need for rigorous, controlled studies that include educational, behavioural, environmental and economic supports</p>

Reference	Review description	Description of the included literature and outcomes	Review findings	Comments
	1995 to 2006			
Goetzel and Ozminkowski (2008) <i>The health and cost benefits of work site health-promotion (WHP) programs</i>	(Narrative) review <i>Inclusion criteria:</i> <ul style="list-style-type: none">• None listed• Indicated that the literature supporting the hypotheses that WHP programs positively influence workers' health, medical service use, and productivity, was reviewed and that evaluation on the quality of the evidence was completed From the early 1990s	Narrative derived from: <ul style="list-style-type: none">• Examining findings from previous studies• Discussions with subject matter experts• Observations from site visits to several exemplary programs	The following were identified as effective WHP practices: <ul style="list-style-type: none">a. Integrating WHP programs into the organisation's central operationsb. Addressing individual, environmental, policy, and cultural factors affecting health and productivityc. Targeting several health issues simultaneouslyd. Tailoring programs to address specific needs of the populatione. Attaining high participation ratesf. Rigorously evaluating outcomes; andg. Effectively communicating these outcomes to key stakeholders	Methodological limitations in many available studies There is a need for more and better science when evaluating program outcomes Federal initiatives that support cost-benefit or cost-effectiveness analyses are stressed, as is the need to invest in healthy work environments, to complement individual based interventions
Engbers et al. (2005) <i>Worksite health promotion programs with environmental changes: a systematic review</i>	Systematic review <i>Inclusion criteria:</i> <ul style="list-style-type: none">• WHP programs with environmental modifications and PA, dietary intake and health indicators as outcomes Up to Jan 2004	Mainly multi-centre trials All studies aimed to stimulate healthy dietary intake, 3 focused on PA Follow-up average 1 year Methodological quality of most included trials rated poor	Strong evidence from multi-centre trials that environmental modifications have positive effect on dietary intake. Modifications included: <ul style="list-style-type: none">• food labelling• provision of healthy choices in canteen• vending machines Inconclusive evidence for an intervention effect on PA No evidence for an intervention effect on health risk indicators	Publication bias noted More controlled studies of high methodological quality need to be initiated that investigate the effects of environmental interventions on dietary intake and especially on physical activity in an occupational setting

Reference	Review description	Description of the included literature and outcomes	Review findings	Comments
	n=13 studies, mostly multi-centre trials			
<p>Matson-Koffman et al. (2005)</p> <p><i>A site-specific literature review of policy and environmental interventions that promote physical activity and nutrition for cardiovascular health: what works?</i></p>	<p>Literature review</p> <p><i>Inclusion criteria:</i></p> <ul style="list-style-type: none"> • Policy or environmental interventions to promote PA and/or good nutrition • Experimental and quasi-experimental designs and reported behavioural, physiological or organisational change outcomes <p>1970 to Oct 2003</p>	<ul style="list-style-type: none"> • n=5 studies (prompts to increase stair use) • 6 studies (access to places and opportunities for physical activity) • 5 studies (comprehensive work-site approaches, including education, employee and peer support for physical activity, incentives, and access to exercise facilities) • 33 studies (availability of nutritious foods) • 29 studies (point-of-purchase strategies) • 4 studies (systematic officer reminders and training of health care providers to provide nutritional counselling) 	<p>Policy and environmental strategies may promote PA and good nutrition</p> <p>Strongest evidence for influencing physical activity and nutrition behaviours for interventions that involved prompts to increase stair use; access to places and opportunities for physical activity; comprehensive work-site approaches, including education, employee and peer support for physical activity, incentives, and access to exercise facilities; the availability of nutritious foods; and point-of-purchase strategies</p>	<p>Further research is needed to determine the long-term effectiveness of different policy and environmental interventions with various populations and to identify the steps necessary to successfully implement these types of interventions</p>

Reference	Review description	Description of the included literature and outcomes	Review findings	Comments
<p>Sorensen et al. (2004)</p> <p><i>Worksite-based research and initiatives to increase fruit and vegetable consumption</i></p>	<p>Review</p> <p><i>Inclusion criteria:</i></p> <ul style="list-style-type: none"> • Environmental and policy approaches • Comprehensive programs that address individual behaviour change and change in the workplace environment and are designed to increase the consumption of F&V • Focus on peer-reviewed literature <p>Dates searched not stated; n=?</p>	<p>Initiatives focused on the physical and informational environments, with the dual aim of increasing the availability of healthful food options and providing education and support through point-of-choice labeling and signage</p>	<p>Environmental/organisational initiatives rely on management commitment, supervisory support and supportive organisational structures to sustain policy efforts over time</p> <p>Program effectiveness is enhanced when they are based on social ecological approaches; include worker participation in program planning and implementation (e.g. employee advisory boards and peer-delivered interventions); address multiple (vs. single) risk factors for change; and integrate workers' broader social context (e.g. families, neighbourhoods, etc.)</p>	<p>Not an exhaustive review</p> <p>Future research is needed to identify key policy and program components that will yield meaningful increases in F&V consumption; barriers/facilitators of organisational and environmental change within worksites; effective community-based participatory methods; and methods to disseminate cost-effective interventions for all worksites</p>

Reference	Review description	Description of the included literature and outcomes	Review findings	Comments
Proper et al. (2003) <i>The effectiveness of worksite physical activity programs on physical activity, physical fitness, and health</i>	Systematic review <i>Inclusion criteria:</i> <ul style="list-style-type: none"> RCT and non-RCTs of workplace PA or fitness interventions involving working populations Had PA or fitness or health-related outcomes 1980 to 2000 n=26 studies	15 RCTs 11 non-randomised, controlled trials (none high methodological quality)	Strong evidence that workplace PA interventions positively affect PA participation (and musculoskeletal disorders) Inconclusive evidence that workplace PA interventions affect body weight, body composition, cardio respiratory fitness, blood serum lipids, blood pressure and general health	Because of the few high quality randomised controlled trials, it is strongly suggested that this type of study be carried out Future randomised controlled trials should pay special attention to the description of randomisation, inclusion criteria, compliance, and analyses according to intention to treat

Table 4B. Summary of reviews contained in the grey literature on interventions to increase physical activity and improve diet (and weight outcomes) in and via the workplace

Reference	Description	Findings	Comments/Implications
<p>Bellew et al. (2012)</p> <p><i>Workplace screening programs for chronic disease prevention: a rapid review</i></p> <p>(An evidence check review brokered by the Sax Institute for the NSW Ministry of Health)</p>	<p>Review</p> <p><i>Inclusion criteria:</i></p> <ul style="list-style-type: none"> Adults, risk factors, chronic disease Health risk assessment (HRA) Workplace or pharmacy <p>Strict quality assessment used (guidance on levels of evidence provided by the NHMRC plus methods used by the US CDC and US Preventive Services Task Force; and Suitability of study design for assessing evidence of effectiveness; and whether execution of the selected study was good, fair or poor)</p> <p>Retrieved studies (n):</p> <ul style="list-style-type: none"> 52 reviews 42 controlled trials 5 quasi-experimental designs 22 cohort studies 46 other studies and reports <p>Jan 2000 to March 2012</p>	<ol style="list-style-type: none"> Strong evidence of effectiveness of HRAs (when used in combination with other interventions) in relation to tobacco use, alcohol use, dietary fat intake, blood pressure and cholesterol Sufficient evidence for effectiveness of worksite programs to control overweight and obesity Sufficient evidence of effectiveness for workplace HRAs in combination with additional interventions to have favourable impact on the use of healthcare services (such as reductions in emergency department visits, outpatient visits, and inpatient hospital days over the longer term) Sufficient evidence for effectiveness of benefits-linked financial incentives in increasing HRA and program participation Sufficient evidence that for every dollar invested in these programs an annual gain of \$3.20 (range \$1.40 to \$4.60) can be achieved Promising evidence that even higher returns on investment can be achieved in programs incorporating newer technologies such as telephone coaching of high risk individuals and benefits-linked financial incentives Promising evidence that the next generation of more effective programs will combine a comprehensive approach together with interventions targeting high-risk individuals and incorporating a dose–response model of increasing levels of intensity 	<p>The majority of retrieved studies were conducted in North America or in Europe</p> <p>In most cases, study subjects for whom the interventions ‘worked’ were self-selecting so that interventions proven to be ‘effective’ in the context of research trials with volunteers may encounter barriers in a subsequent ‘real world’ implementation process</p>
<p>Curry (2012)</p> <p><i>Workplace</i></p>	<p>Review</p> <p><i>Inclusion criteria:</i></p>	<ol style="list-style-type: none"> It is widely accepted that a comprehensive approach, combining programming with policy implementation and environmental changes, is the key to successful, sustainable health promotion initiatives: 	<p>This review provides a list of policy and environmental approaches that can be</p>

Reference	Description	Findings	Comments/Implications
<i>physical activity: a review of literature examining policy and environmental approaches</i>	<ul style="list-style-type: none"> Articles discussing workplace PA promotion <p>Published 2001–2011</p> <p>(NB: two articles prior to 2001 were included because they were referenced by multiple recent articles and provided applicable data relevant to this review)</p> <p>n=51 (including systematic literature reviews, meta-analyses, experimental and quasi-experimental studies, reports and narratives)</p>	<ul style="list-style-type: none"> Workplace policy and environmental strategies are an essential component in any initiative aiming to bring about long-term, population level changes in employee PA Adopting a workplace PA policy and/or adapting the work environment to support opportunities to be physically active can benefit both employers and employees in multiple ways <p>2. The literature identifies the following as potential policy approaches for workplaces:</p> <ul style="list-style-type: none"> Allowing flexible work time for employees to engage in PA Allowing/encouraging breaks from prolonged sitting Adopting transport plans or employee commute programs such as Smart Commute to encourage active transportation Providing subsidies to employees who want to take part in PA outside of work <p>3. Environmental changes workplaces can make to support employee PA include:</p> <ul style="list-style-type: none"> Providing on-site facilities that support PA such as walking paths, secure bike storage, showers, lockers, change rooms and gyms; Offering partial/full reimbursement to employees for recreation or gym memberships Posting signage to take the stairs Improving the aesthetics and safety of stairwells Mapping out walking trails or routes around the workplace along with estimated time and distance Providing child care during after-hours <p>4. Public Health professionals should be providing resources and consultations in order to effectively support employers in the creation of sustainable PA through workplace policy and environmental approaches</p>	undertaken to underpin more comprehensive, individually-based programs
Hector et al (2012) <i>A review of available information on workplace physical activity</i>	<p>Review</p> <p><i>Inclusion criteria:</i></p> <ul style="list-style-type: none"> Individual or team-based program or intervention that was based in the workplace (run through the workplace/worksite) AND 	<p>1. Workplace PA, nutrition or weight health promotion programs involving challenge events or competition of some sort, and/or involving incentives:</p> <ul style="list-style-type: none"> Nearly all produced positive changes in participants' PA or nutrition behaviours and/or cardiovascular disease (CVD) risk factors. Some of these were longer term changes: <ul style="list-style-type: none"> Decrease in CVD risk factors in all three studies in which they were measured (even in absence of changes in weight) 	Workplace nutrition and physical activity challenges are effective at increasing PA and healthy eating, as well as metabolic risk factors although effectiveness on BMI is uncertain (although not

Reference	Description	Findings	Comments/Implications
<i>and nutrition challenges</i>	<ul style="list-style-type: none"> Was aimed at employees (or their employers too) AND Involved the words ‘competition’ or ‘challenge’ or ‘contest’ AND/OR involved the giving of incentives (prizes, awards, rewards) according to weight/PA/nutrition/health outcomes, or for participation <p>n = 18 peer-reviewed studies, 6 reports involving evaluations of workplace challenges, and a number of websites supporting challenge events</p>	<ul style="list-style-type: none"> Measures of PA (e.g. steps, number of episodes of walking >10 minutes) were increased in seven studies Fitness levels increased in four studies Healthy eating improved in 3/4 studies in which it was targeted (NB: only 4/18 peer-reviewed studies were aimed at nutritional behaviour change) These types of programs were less successful at reducing BMI, although in four studies weight was reduced, even at longer term follow-up <p>2. Specifically:</p> <ul style="list-style-type: none"> Incentives <ul style="list-style-type: none"> No strong evidence to indicate the relative effectiveness of tangible incentives compared to other program components. Although, the use of disincentives (e.g. loss of money deposited by individuals at the start of a program) is possibly effective Team or individual competition <ul style="list-style-type: none"> The effectiveness as a particular component of workplace health programs is largely unknown Although, most studies involving team competition found that it was considered to be at least a moderate motivational factor and may be more motivating and acceptable to men It appears to be useful and in increasing morale and improving co-workers’ relationships in the workplace Tools to help keep track of progress <ul style="list-style-type: none"> Weekly weight ins were identified as a useful component of workplace challenge events aimed at weight change Pedometers have achieved mixed results → need to be good quality, and are more appealing to woman than men Scoreboards placed in the workplace common areas may be useful Websites have the capacity to reach large numbers of people; however the usefulness of websites as a particular component of worksite challenges is uncertain, as is their effectiveness as the medium for ‘overall implementation’ → communication via a number of mediums is likely to be beneficial Organisational/managerial support 	<p>frequently measured as an outcome)</p> <p>Identifies specific components of effective individual and team-based nutrition and PA challenge-type programs in the workplace</p> <p>Considerable scope for more rigorous evaluation of the reach, participation and effectiveness of workplace challenge events</p> <p>It is recommended that any new initiatives incorporate high quality evaluation</p>

Reference	Description	Findings	Comments/Implications
		<ul style="list-style-type: none"> ◦ Often cited as essential to program success and incentives for employers could improve worksite participation in challenges ◦ The convenience of programs is also important • Employee characteristics <ul style="list-style-type: none"> ◦ Women, white-collar workers and younger and middle-aged workers were more likely to participate in workplace challenges ◦ Men have exhibited a preference for 'exercise' challenges Programs tailored towards blue-collared workers can work well if workers are engaged in the design of program and development of competition components ◦ Having a range of components for workers to choose from may be advantageous ◦ Shift workers and part-time workers are harder to reach & little is known about non-participants in workplace challenges • Regular health checks <ul style="list-style-type: none"> ◦ Participation with detailed individualised feedback (during work time and with risk management advice) can motivate workers to engage in a more extensive, multi-faceted program involving competitions and other components ◦ Incentives may be successfully used to increase participation in the health checks 3. Grey literature <ul style="list-style-type: none"> • Effective challenges often include short-term, one-off events, and that it may be useful to extend them to families and friends 	
VicHealth (2012) <i>Reducing prolonged sitting time in the workplace</i>	Report Conducted an evidence review to identify interventions that reduce sitting in the workplace <i>Inclusion criteria:</i> <ul style="list-style-type: none"> • Focus on interventions that had a whole-of organisation and systems approach • A broad search of national and international peer-reviewed as 	<ol style="list-style-type: none"> 1. Workplace sitting reduction interventions identified in the review typically had a beneficial or neutral impact on productivity, absenteeism and injury costs, where the relevant evidence could be identified 2. No studies suggested likely harm from sensibly implemented breaks from, or reductions in, workplace sitting time 3. In order to effectively reduce prolonged sitting, workplace interventions should: <ul style="list-style-type: none"> • Incorporate change elements targeting the organisation, environment and individual • Secure a commitment from all stakeholders • Enable employee participation • Be sustained and integrated into the organisational structure 	Mixed study quality Reliable and valid measures of workplace sitting time generally not used As the evidence base on the prevalence and impacts of workplace sitting increases, it is expected to provide further data on the benefits that will accrue from reducing workplace sitting,

Reference	Description	Findings	Comments/Implications
	well as other literature produced 34 items, of which 13 (reporting on 11 distinct studies) met the search inclusion criteria	<ul style="list-style-type: none"> • Use multiple and mutually reinforcing strategies • Be flexible and allow for adaptation to the context • Use a strong evaluation framework • Conduct a baseline assessment • Be of minimum three-months duration with long-term follow-up • Use existing guidelines and frameworks 	both to individuals (i.e. better health) and to organisations (i.e. improved productivity)
Vaughan-Jones and Barham (2010) <i>Healthy work: evidence into action</i> BUPA	Report Aimed at government, employers and providers of workplace health interventions Aimed to identify what can be done to help realise cost savings (generated from improved workplace health) for the benefit of UK businesses, the economy and society	1. Recommendations for government: <ul style="list-style-type: none"> • Improve co-ordination of government policy on workplace health – further emphasise the link between organisational performance, national prosperity and the health of the nation's workforce • Drive awareness of the workplace as a location for improving public health by encouraging primary care trusts to partner with local employees • Push more employers to report publicly on their investment in workplace health by publicly recognizing those that do • Research the options for financial incentives for employers to invest in workplace health • Increase the co-ordination or research to improve the evidence base for workplace health 2. Recommendations for employers: <ul style="list-style-type: none"> • Invest where it makes sense – in health interventions that are known to be effective • Understand the health profile of your workforce and involve employees in decisions about investment in workplace health: • Ensure that workplace health interventions have clear objectives and are supported by senior management • Track key metrics about the health of the workforce, such as levels of sickness absence, health and general wellbeing • Consider improving the quality of work as well as more traditional workplace health interventions • Find innovative ways to involve as many employees as possible in workplace health 	Data from the UK Review did not identify specific intervention components

Reference	Description	Findings	Comments/Implications
		<p>interventions</p> <p>3. Recommendations for providers of workplace health interventions:</p> <ul style="list-style-type: none"> • Provide tools to help employers understand the health profile of their workforce • Develop a broader array of interventions that support employees to lead healthier lives • Develop a broader array of interventions that support people with long-term conditions in the workplace • Gather more evidence on how to manage the impact of work on health and share this knowledge with employers • Gather more evidence on how to implement workplace health interventions in a way that will maximise their effectiveness and share this knowledge with employers • Offer a more integrated set of workplace health interventions 	
<p>Chau (2009)</p> <p><i>Evidence module: workplace physical activity and nutrition interventions</i></p>	<p>Evidence Review to inform policy and practice</p> <p>Provides an overview of the best evidence available about workplace health promotion programs to promote PA, healthy diet or both and prevent overweight and obesity</p> <p>Synthesises findings and recommendations from multiple systematic reviews and recent reports</p>	<ul style="list-style-type: none"> • Strong evidence that multi-component workplace interventions that address PA, nutrition or both are effective for : <ul style="list-style-type: none"> ◦ Increasing PA ◦ Promoting healthy eating ◦ Preventing non-communicable diseases like obesity • Effective types of PA strategies to implement include: <ul style="list-style-type: none"> ◦ Providing prompts to encourage stair use ◦ Providing access to places or opportunities for PA; and ◦ Providing education or peer support • Effective types of strategies to address nutrition are those that modify the food environment. This includes: <ul style="list-style-type: none"> ◦ Food labeling; ◦ Point-of-purchase promotions; and ◦ Providing access and improving availability of healthy food choices such as in canteens and vending machines • Evidence that the following approaches are important elements of effective multi-component interventions that target PA, nutrition, or both: <ul style="list-style-type: none"> ◦ Provide counselling or individual behavioural skills training ◦ Involve workers in program development and implementation 	<p>Further research is needed to increase the generalisability of programs to all workers and different population groups, including those most at risk; and, to examine the degree to which strategies may be translated and sustained across different working contexts (e.g. part-time, casual, blue collar and rural workforce groups)</p> <p>More evidence of the long term sustainability of interventions, as well as data on their economic efficiency (e.g. cost-effectiveness), is needed</p>

Reference	Description	Findings	Comments/Implications
Hooper and Bull (2009) <i>Healthy active workplaces: Review of evidence and rationale for workplace health</i>	Report Commissioned by the Department of Sport and Recreation to provide an updated review of information on workplace PA and health promotion programs to inform the developments of this agenda in Western Australia	<ol style="list-style-type: none"> 1. A strong or definitive base of evidence on the effectiveness of interventions was found for the following areas: <ul style="list-style-type: none"> • PA <ul style="list-style-type: none"> ◦ prompts to increase stair use ◦ access to places and opportunities for PA ◦ education, employee and peer support ◦ multi-component interventions combining nutrition and PA • Nutrition / weight loss <ul style="list-style-type: none"> ◦ multi-component interventions that include PA as well as nutrition (strategies such as nutrition education, dietary prescription, behavioural skills development and training to control adult overweight and obesity) ◦ enhanced access to and availability of nutritious foods ◦ promotional strategies at point-of-purchase 2. Key components of a workplace health promotion program were also identified: <ul style="list-style-type: none"> • Management involvement and support • Integration with existing business planning and values • Project planning and implementation: <ul style="list-style-type: none"> ◦ Ensure employees are consulted and engaged in all planning and delivery processes ◦ Conduct a 'needs assessment' ◦ Adequate provision for the co-ordination of workplace health programs ◦ The development of formalised and recognised 'workplace champion' roles ◦ The skill set individuals leading a workplace health project should possess include management, planning, co-ordination and good communication skills across diverse audiences ◦ May need support from external providers ◦ Providing information on, or links to, local resources and providing advice (do not need to deliver all initiatives on site) • Communication/marketing/promotion • Develop multi-component programs <ul style="list-style-type: none"> ◦ Aim to cover a multitude of different health-related issues/topics ◦ Avoid an over emphasis of on approach to an issue ◦ Creating a "supportive physical environment" within the workplace should be 	<p>Includes a review of strength of evidence regarding specific intervention components regarding nutrition and PA; as well as key components/best practice elements</p> <p>Focused on relevance for Western Australia therefore likely to be applicable to NSW</p>

Reference	Description	Findings	Comments/Implications
		<p>viewed as an essential component of a workplace health program</p> <ul style="list-style-type: none"> Changes to the workplace environment and policies Organisational policy to support healthy lifestyles should be developed to ensure long-term commitment resourcing and sustainability (integrated within one or more related policy areas) <ul style="list-style-type: none"> Indicators of success <ul style="list-style-type: none"> At least 12 months is necessary as an initial start up phase Changes to the physical workplace environment and workplace policies can take 2-3 years or longer Changes in individual behaviours (e.g. lifestyle risk factors) can take 6-12 months Behaviour change is difficult to detect on a population level in the short term Evaluation 	
<p>Quintiliani et al. (2008)</p> <p><i>The workplace as a setting for interventions to improve diet and promote physical activity</i></p> <p>Background paper prepared for the WHO/WEF Joint Event on preventing non-communicable diseases in the workplace</p>	No description provided	<ul style="list-style-type: none"> Several collaborating groups have determined 'best practices' for planning WHP programs, with numerous recommendations overlapping: <ul style="list-style-type: none"> Linking the WHP activities to organisational objectives, support from top management, and broad-reaching communication programs are important to establish and maintain WHP programs Incentives, such as gift cards, reduced medical costs, and cash payments encourage employee participation in program activities Monitoring progress towards program objectives through a built-in evaluation process is needed to ensure that the program can be revised as necessary based on employee feedback Several guidelines from behavioural science that can guide program activities, such as: <ul style="list-style-type: none"> goal-setting motivational stages of change Comprehensive WHP programs integrate health promoting strategies across work organisations including: <ul style="list-style-type: none"> occupational safety and health (OSH) disability management, and employee assistance programs 	This background paper identifies a mixture of intervention components and best practice type elements for successful WHPPs
Ackland et al. (2005)	Report	<ul style="list-style-type: none"> Education, awareness and advocacy: <ul style="list-style-type: none"> Improved education, communication and advocacy to WA workplaces on the 	Undertaken by the University of WA, on behalf of the WA

Reference	Description	Findings	Comments/Implications
<i>Workplace health and physical activity (WHPA) program review</i>	<p>The review focused on the organisational commitment (including policy, strategic, structural and management factors) to establish a better understanding of the characteristics of successful WHPA programs</p> <p>Data collected in 3 phases:</p> <ol style="list-style-type: none"> Series of interviews with WHPA service providers (n=12) Comprehensive survey instrument sent to various organisations in WA Representatives from several organisations (n=6) were selected for focus group interviews 	<p>economic, social and health benefits of WHPA programs</p> <ul style="list-style-type: none"> That a summit, forum, or conference be conducted involving key stakeholders to facilitate a dialogue and networking opportunities among employer organisations, government policy makers, researchers, health promotion agencies and other key groups Promotion of Best Practice: <ul style="list-style-type: none"> Elements and characteristics of successful WHPA programs and best practice case studies be promoted widely throughout WA workplaces That consideration be given to creating an awards/recognition process to give due recognition to progressive organisations that have implemented successful WHPA programs A coordinating entity: <ul style="list-style-type: none"> That an entity be established to enquire, coordinate, lobby, educate, and promote WHPA programs to employers and their workforce in WA. Broader than just health. Establish partnerships to provide incentives for organisations to plan, implement and expand WHPA programs (e.g. insurance, financial subsidies) Creating incentives and removing barriers: <ul style="list-style-type: none"> That the Western Australian Government explore opportunities to provide incentives and remove barriers for organisations to plan, implement or expand WHPA programs, including: <ul style="list-style-type: none"> Establish a grants scheme of seed funding Review workers compensation insurance rules Introduce financial incentive schemes Negotiate with the Federal Government on Fringe Benefits Tax barriers Regional, rural and remote communities: <ul style="list-style-type: none"> That current information, resources and consultancy support be provided to regional, rural and remote communities/organisations through a range of strategies, including: development of innovative, targeted education and training strategies and dissemination of practical initiatives to facilitate WHPA program promotion in these areas, via the engagement of local facilities and services. Small Business: <ul style="list-style-type: none"> Practical initiatives be developed and disseminated to facilitate WHPA program promotion in small businesses via the creation of strategic partnerships, and 	<p>Department of Sport and Recreation</p> <p>Did not identify specific intervention components but upstream processes and factors affecting successful WHPPs</p>

Reference	Description	Findings	Comments/Implications
		<p>engagement of local facilities and services.</p> <ul style="list-style-type: none"> • Further research: <ul style="list-style-type: none"> ◦ Into the efficacy of various WHPA program models for organisations of differing demography within the WA context ◦ Employees as the recipients or potential recipients of WHPA programs • WHPA service providers: <ul style="list-style-type: none"> ◦ That the establishment of a WHPA service industry representative body (minimum professional standards for education and training, code of ethics/best practice principles, accreditation and registration schemes) be investigated with service providers 	
<p>Chapman. (2004)</p> <p><i>Expert opinions on 'best practices' in worksite health promotion (WHP)</i></p> <p>From edition of 'The Art of Health Promotion' conducted under the American Journal of Health Promotion</p>	<p>Identification of possible 'best practice' program strategies in four areas or domains:</p> <ul style="list-style-type: none"> • Program management activities • Behaviour change activities • Recruitment and participation activities • Ongoing communication activities <p>Academic and practitioner experts (12 of each) were invited to add additional program strategies to the list generated by the authors and then from the updated list rank their top 7 choices in each domain</p>	<p>Considerable commonality of perspective in the two groups plus some unique perspectives</p> <p>The order of the items begins with those items that result from agreement from both groups of experts and then include those practices that reflected consensus within each group individually including promising but unproven practices</p> <ol style="list-style-type: none"> 1. Building top management support 2. Integrating program with organisational/business goals 3. Sound communication process 4. Uses of stages of change concept 5. Creating supportive cultures 6. Incentive recruitment features 7. Personal contact or word of mouth 8. Targeted personal invitations 9. Targeted personal communication 10. Announcements made during meetings 11. Sense of program ownership 12. Use of self-efficacy concept 	<p>The survey did not include any descriptive information on each of the program strategies</p> <p>No effort made to define the context of the worksite settings involved</p>

Reference	Description	Findings	Comments/Implications
		13. Use of a health website, internet and intranet strategies 14. Use of a program database or informational structure	
National Institute for Health and Clinical Excellence (NICE) (2004) <i>Workplace interventions: alcohol and diet</i>	<p>Health Development Agency briefing paper</p> <p>As part of ‘Choosing Health?’ – the national consultation on a new public health white paper – the government appointed task groups to lead on eight key themes, one of which was working for health/opportunities in employment</p> <p>The HDA supported the task groups, which met during April–May 2004, with these briefing papers</p>	<ul style="list-style-type: none"> • Healthy-eating interventions: <ul style="list-style-type: none"> ◦ 3/4 good quality studies show positive effects of healthy-eating interventions in the workplace (positive effects on consumption of fat, fruit and vegetables, intention to make dietary changes, and self-efficacy) • Characteristics of an effective workplace intervention include: <ul style="list-style-type: none"> ◦ Visible and enthusiastic support and involvement from management ◦ Involvement by employees at all levels in the planning and implementation phases so that there is a sense of ownership ◦ Screening and/or individual counselling ◦ Changes to the composition of best-selling foods provided in canteens and vending machines, and promotion at the point of purchase ◦ Tailoring interventions to suit the characteristics and needs of the employees ◦ Combining population-based policy initiatives with intensive individual and group-based interventions ◦ Building in sustainability so that the intervention becomes embedded within normal practices ◦ Employees who enjoy the support of their family in making dietary changes ◦ Motivators such as incentives, competitions and events to launch the intervention 	<p>Identified only a few good-quality healthy-eating interventions in workplaces</p> <p>Did not examine WHPPs aimed at increasing PA</p>

Table 4C. Summary of single studies (published 2010–2012) aimed to increase physical activity and improve diet (and weight status) in and via the workplace

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
2012						
<p>Dallam and Foust (2012)</p> <p><i>A comparative approach to using the diabetes prevention program to reduce diabetes risk in a worksite setting</i></p> <p>US</p>	<p>Relative effectiveness of three different approaches to the implementation of the Diabetes Prevention Program, a standardised diabetes prevention curriculum, in various worksite organizations within a single community</p>	<p>264 staff members from four worksites</p> <p>A newspaper publisher, two departments within a public hospital, the city/county health department, and the city/county police department</p>	<p>An intensive one-on-one counselling approach, a support group meeting approach, and a passive transfer of information approach</p>	<p>Significant mean improvements overall in the participants who completed the 26-week program as follows:</p> <ul style="list-style-type: none"> a. Reduction in overall mean body weight and mean body mass index b. Reduction in overall average mean arterial blood pressure c. Reduction in overall mean diabetes risk score d. Increase in overall mean physical activity level <p>Largest proportion of these changes occurred in the one-on-one intervention group, significant changes in some factors were found in all groups</p>	<p>Three-group quasi-experimental design</p>	<p>This illustrates the utility of an on-site and incentive-driven approach to diabetes risk factor modification in the workplace</p>
<p>DeJoy et al. (2012)</p> <p><i>Process evaluation results from an environmentally focused worksite weight management study</i></p>	<p>Study presents process evaluation results from a workplace-based study that tested two levels of environmentally focused weight management interventions in a manufacturing setting</p>	<p>12 worksites of The Dow Chemical Company</p> <p>10,281 employees at the 12 Dow sites at the beginning of the study; 8,013 were at the treatment sites (n=9) and 2,268 at the control sites (n=3)</p>	<p>The moderate treatment featured a set of relatively simple, low-cost environmental modifications designed to facilitate healthy eating and physical activity</p> <p>The intense treatment added elements intended to</p>	<p>Fidelity varied across the 11 interventions comprising the two treatment conditions but did not vary systematically by treatment condition (moderate vs. intense)</p> <p>Environmental assessments showed improvements in workplace supports for weight management and significant differences by</p>	<p>Pre-post process evaluation</p>	<p>Environmental interventions, like most other types of intervention, are not automatic or inherently permanent</p> <p>They must be carefully planned</p>

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
			actively involve and engage management in program efforts	treatment level. Positive shifts in health climate perceptions also occurred, but sites receiving the intense treatment were not perceived as more supportive by employees		and implemented, refreshed as needed, and actively monitored across time
Flannery et al. (2012) <i>The Worksite Heart Health Improvement Project (WHHIP): feasibility and efficacy</i>	Test the feasibility and efficacy of WHHIP	Thirty-nine female minority nursing assistants participated in this study with a mean age of 42.39 (SD=12.79) years	The 3-month WHHIP intervention included 3 components: environmental and policy assessment; education; and on-going motivation. The control site received education only	Subject participation averaged 47% and 58% in exercise and diet related activities, respectively. Generalised estimating equations showed the treatment group showed significant improvements in depressive symptoms ($p=.012$), systolic blood pressure ($p=.028$), total cholesterol ($p=.002$) and triglycerides ($p=.011$) over time. The treatment group also showed trends for improvement in diet behaviors ($p=.069$) and diastolic blood pressure ($p=.073$)	Quasi-experimental 6-month pilot	This study provided feasibility evidence for the WHHIP and preliminary evidence that the WHHIP can improve heart healthy behaviors and subsequent outcomes among nursing assistants in long-term care settings
Peggy et al. (2012) <i>Stakeholder perspectives on workplace health promotion: a qualitative study of mid-sized employers in low-wage industries</i> US	Study goals were to: 1. Describe stakeholder perceptions of workplace health promotion (WHP) appropriateness 2. Describe barriers and facilitators to implementing WHP 3. Learn the extent to which WHP programs are	Subjects: 34 human resources professionals in charge of WHP programs and policies from five low-wage industries: accommodation/food services, manufacturing, health care/social assistance, education, and retail trade	Focus groups were conducted with reps. of mid-sized (100–999 workers) workplaces in the Seattle metro area, Washington state Qualitative analysis of focus group transcripts using grounded theory to identify themes	Most participants viewed WHP as appropriate, but many expressed reservations about intruding in workers' personal lives. Barriers to implementing WHP included cost, time, logistical challenges, and unsupportive culture. Participants saw value in extending WHP programs to workers' partners, but were unsure how to do so. Most were willing to work with nonprofit agencies to offer WHP	Five 1.5-hour focus groups	Mid-sized, low-wage employers face significant barriers to implementing WHP; to reach these employers and their workers, nonprofit agencies and WHP vendors need to offer WHP programs that are inexpensive,

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
	<p>offered to workers' spouses and partners and assess attitudes toward including partners in WHP programs</p> <p>4. Describe willingness to collaborate with nonprofit agencies to offer WHP</p>					turnkey, and easy to adapt
<p>Harding et al. (2012)</p> <p><i>Change in Health-related Quality of Life amongst participants in a four-month pedometer-based workplace health program</i></p>	<p>Evaluation of participation in a pedometer-based PA program in the workplace and association with changes in health-related quality of life (HRQoL)</p>	<p>487 voluntary employees enrolled in a health program</p>	<p>Volunteers completed the SF-12(R) Health Survey at baseline and four-months</p> <p>Change in Physical and Mental component summary scores (PCS; MCS)</p>	<p>Participation in the program was associated with an increase of 1.5 MCS units (95% confidence interval (CI) 0.76, -2.09). Greater improvements in MCS were observed in those reporting an increased level of PA during the program (1.9 [CI 0.78, 2.92] versus 0.9 [CI -0.12, 2.03]) and a lower baseline MCS score (6.3 [CI 4.80, 7.62] versus -1.5 [CI -2.21, -0.80]). No change in PCS was observed</p>	<p>Pre-post no comparison</p>	<p>Recommend the use of a broad perspective of health be utilised in both the implementation and evaluation of workplace PA programs</p>

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
Laing et al. (2012) <i>Increasing evidence-based workplace health promotion best practices in small and low-wage companies in Mason County, Washington, 2009</i> US	The American Cancer Society's <i>HealthLinks</i> is a workplace health promotion program that targets 3 modifiable health risk behaviors: physical inactivity, unhealthy eating, and tobacco use. We evaluated employers' implementation of <i>HealthLinks</i> in small workplaces	23 workplaces participated in the program	Conducted baseline assessments of workplaces' implementation of program, policy, and communication best practices targeting the health risk behaviors. Offered tailored recommendations of best practices to improve priority health behaviors and helped workplaces implement <i>HealthLinks</i> At 6 months post intervention, assessed changes in best practices implementation and employers' attitude about <i>HealthLinks</i>	From baseline to follow-up, observed significant increases in the implementation of physical activity programs (29% to 51%, $P=.02$), health behavior policy (40% to 46%, $P=.047$), and health information communication (40% to 81%, $P=.001$) Employers favorably rated <i>HealthLinks</i> ' appeal, relevance, and future utility	Pre-post no comparison	Results also suggest that <i>HealthLinks</i> might be a sustainable program for small workplaces with limited resources
Lassen et al. (2012) <i>Effectiveness of a Canteen Take Away concept in promoting healthy eating patterns among employees</i> Denmark	To investigate the effectiveness of a relatively novel concept of providing employees with healthy ready-to-heat meals to bring home to their families, here referred to as Canteen Take Away (CTA)	A financial worksite offering CTA (twenty-seven employees)	Employees' dietary intake on two weekdays when they received free CTA was compared with that on weekdays when they did not receive CTA. Four non-consecutive 24 h dietary recalls were applied to assess dietary intake on a daily basis. Moreover, a digital photographic method was used to assess evening meal intake for three consecutive weeks	Overall dietary quality as expressed by the energy density of the food (excluding beverages) was found to be significantly lower on days consuming CTA meals compared to days not consuming CTA with regard to evening meal intake (average difference: -187 (95%CI -225, -149) kJ/100 g) and on a daily basis (average difference: -77 (95%CI -132, -21) kJ/100 g). Other favourable differences included increased vegetable intake (average difference: 83 (95%CI 67, 98) g/evening meal, 109 (95%CI 62, 155)	Pre- post- no comparison group	Reinforces the importance of availability and convenience as effective tools to promote healthy eating habits

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
				g/d)		
<p>LeCheminant & Merrill (2012)</p> <p><i>Improved health behaviors persist over two years for employees in a worksite wellness program</i></p> <p>US</p>	<p>To evaluates whether improvements in health behaviors related to a worksite wellness program persist through 2 years</p>	<p>267 individuals employed from 2009 through 2011</p>	<p>The program was designed to build behavioral capability and self-efficacy by yielding immediately applicable skills and tools and segmenting the behavior change process into weekly, manageable doses</p>	<p>Significant improvements were observed in the frequency and volume of exercise, and the consumption of vegetables and fruits over 12 and 24 months. Requests for health coaching significantly increased over the study period</p>	<p>Longitudinal, single site</p>	<p>The type of wellness program evaluated in this study produced sustainable health behaviors through 24 months, which likely will translate into future positive health outcomes and improved employee productivity</p>
<p>Linde et al. (2012)</p> <p><i>HealthWorks: results of a multi-component group-randomized worksite environmental intervention trial for weight gain prevention</i></p> <p>US</p>	<p>To implement a four-component environmental intervention at the worksite level to positively influence weight gain among employees over a two-year period</p>	<p>Six worksites in a US metropolitan area were recruited and randomised in pairs at the worksite level to either a two-year intervention or a no-contact control</p>	<p>Environmental components focused on food availability and price, physical activity promotion, scale access, and media enhancements</p> <p>Evaluations at baseline and two years included:</p> <ol style="list-style-type: none"> 1. Measured height and weight 2. Online surveys of individual dietary intake and physical activity behaviors 3. Detailed worksite environment assessment 	<p>Mean participant age was 42.9 years (range 18-75), 62.6% were women, 68.5% were married or cohabiting, 88.6% were white, 2.1% Hispanic</p> <p>Mean baseline BMI was 28.5 kg/m(2) (range 16.9-61.2 kg/m(2)). A majority of intervention components were successfully implemented. However, there were no differences between sites in the key outcome of weight change over the two-year study period (p=.36)</p>	<p>Group-randomised trial</p>	<p>Results raise questions about whether environmental change at worksites is sufficient for population weight gain prevention</p>

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
Robroek et al. (2012) <i>Cost-effectiveness of a long-term Internet-delivered worksite health promotion program on physical activity and nutrition: a cluster randomized controlled trial</i> US	The intervention consisted of several additional website functionalities: action-oriented feedback, self-monitoring, possibility to ask questions and monthly e-mail messages	924 participants enrolled in a 2-year cluster randomised controlled trial, with departments (n=74) within companies (n=6) as the unit of randomisation	<p>The intervention was compared with a standard program consisting of a physical health check with face-to-face advice and personal feedback on a website</p> <p>Primary outcomes: PA and F&V intake. Secondary outcomes: self-perceived health, obesity, elevated blood pressure, elevated cholesterol level and maximum oxygen uptake</p> <p>Direct and indirect costs calculated from a societal perspective</p> <p>Process evaluation</p>	<p>No statistically significant differences were found on primary and secondary outcomes, nor on costs</p> <p>Average direct costs per participant over the 2-year period were euro376, and average indirect costs were Euro9476.</p> <p>In conclusion, no additional benefits were found in effects or cost savings</p>	Cluster randomised controlled trial	The program in its current form was not recommended for implementation
Strijk et al. (2012) <i>A worksite vitality intervention to improve older workers' lifestyle and vitality-related outcomes: results of a randomized controlled trial</i> US	To evaluate the effectiveness of a worksite vitality intervention on vigorous physical activity (VPA), fruit intake, aerobic capacity, mental health and need for recovery after work among older hospital workers (45 years and older)	Workers in intervention group (n=367), control (n=363)	<p>6-month intervention</p> <p>Workers in the intervention group received the Vital@Work intervention containing:</p> <ol style="list-style-type: none"> 1. A Vitality Exercise Program (VEP) combined with 2. 3 visits to Personal Vitality Coach <p>The VEP consisted of a</p>	<p>Effects were found for sports activities (beta=40.4 min/week, 95%CI 13.0 to 67.7) and fruit intake (beta=2.7 pieces/week, 95%CI 0.07 to 4.7) and were stronger for workers with high compliance to yoga (sport: beta=49.6 min/week, 95%CI 13.9 to 85.2; fruit: beta=3.8 pieces/week, 95%CI 1.1 to 6.4) and workout sessions (sport: beta=72.9 min/week, 95%CI 36.1 to 109.8; fruit: beta=4.0 pieces/week, 95%CI 1.1 to 6.4).</p>	Randomised controlled trial	Implementation of worksite yoga and workout facilities and minimal fruit interventions should be considered by employers to promote transitions into healthier lifestyles and thereby health

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
			weekly yoga session, a weekly workout session and weekly unsupervised aerobic exercising. Free fruit was provided at the VEP	<p>The intervention group lowered their need for recovery, when compared to controls (beta=-3.5, 95%CI -6.4 to -0.54), with stronger effects for high workout compliance (beta=-5.3, 95%CI -9.3 to -1.3).</p> <p>No effects were found on VPA, aerobic capacity or mental health</p>		
<p>Strijk et al. (2012)</p> <p><i>A worksite vitality intervention for older hospital workers to improve vitality, work engagement, productivity and sick leave: results of a randomized controlled trial</i></p> <p>US</p>	<p>A worksite vitality intervention aiming to improve lifestyle behaviors could be an effective tool to keep older workers vital, and thereby prolong their labor participation. This study evaluates the effectiveness of such an intervention on vitality, work engagement, productivity and sick leave</p>	<p>Workers in intervention (n=367) and control group (n=363)</p>	<p>Intervention group received a 6-month intervention, which included two weekly guided group sessions: one yoga and one workout, as well as one weekly session of aerobic exercising, without face-to-face instruction, and three individual coach visits aimed at changing workers' lifestyle behavior by goal setting, feedback, and problem-solving strategies. Free fruit provided at the guided sessions</p> <p>Intention-to-treat analysis with complete cases (N=500) and imputed data (N=730)</p>	<p>There were no significant differences in vitality, work engagement, productivity, and sick leave between the intervention and control group workers after either 6- or 12-months follow-up</p> <p>Yoga and workout subgroup analyses showed a 12-month favorable effect on work-related vitality (beta=0.14, 95%CI 0.04 to 0.28) and general vitality (beta=2.9, 95%CI 0.02 to 5.9) among high yoga compliers</p> <p>For high workout compliers, this positive trend was also seen, but it was not statistically significant</p>	<p>Randomised controlled trial</p>	<p>If high compliance can be maximised, implementation of worksite yoga facilities could be a useful strategy to promote vitality-related work outcomes</p> <p>Impeding factors for participation should be investigated in more detail</p>

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
<p>Thorndike et al. (2012)</p> <p><i>Prevention of weight gain following a worksite nutrition and exercise program: a randomized controlled trial</i></p> <p>US</p>	<p>To determine if a 9-month maintenance intervention immediately following a 10-week worksite exercise and nutrition program would prevent regain of the weight lost during the program</p>	<p>330 employees from 24 teams completed a 10-week exercise and nutrition program at a large hospital worksite</p>	<p>Employees were randomised by team to maintenance or control (usual care) for 9 months</p> <p>Intervention: Internet support with a website for goal-setting and self-monitoring of weight and exercise plus minimal personal support</p>	<p>At 1 year, 238 subjects (72%) completed follow-up assessments. Mean baseline BMI was 27.6 and did not differ between intervention and control</p> <p>Compared to baseline, both groups lost weight during the 10-week program and maintained 65% of weight loss at 1 year ($p < 0.001$)</p> <p>No difference in weight loss between groups at the end of the 10-week program (4.8 lbs vs 4.3 lbs, $p = 0.53$ for group X time interaction) or end of maintenance at 1 year (3.4 lbs vs 2.5 lbs, $p = 0.40$ for group X time interaction)</p> <p>All subjects had improvements in physical activity and nutrition (increased fruits/vegetables and decreased fat and sugar intake) at 1 year but did not differ by group</p>	<p>Randomised controlled trial</p>	<p>An Internet-based maintenance program immediately following the 10-week program did not improve measured outcomes</p>
2011						
<p>Alinia et al. (2011)</p> <p><i>A workplace feasibility study of the effect of a minimal fruit intervention on fruit intake</i></p>	<p>A 5-month study where workplaces were divided into an intervention group (IG) and a control group (CG)</p>	<p>Eight Danish workplaces were enrolled in the study. Five workplaces were in the IG and three were in the CG</p> <p>124 (IG, n 68; CG, n 56) healthy, mainly normal-</p>	<p>At least one piece of free fruit was available per person per day in the IG</p> <p>Total fruit and dietary intake was assessed, using two 24 h dietary recalls at baseline and at endpoint</p>	<p>Mean daily fruit intake increased significantly from baseline to endpoint only in the IG by 112(se 35) g. In the IG, mean daily intake of added sugar decreased significantly by 10.7(se 4.4) g, whereas mean daily intake of dietary fibre increased significantly by 3.0(se 1.1) g. Vegetable, total energy and</p>	<p>Controlled workplace study</p>	<p>The present study showed that it is feasible to increase the average fruit intake at workplaces by simply increasing fruit availability and accessibility</p>

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
Denmark		weight participants were recruited		macronutrient intake remained unchanged through the intervention period for both groups.		
Backman et al. (2011) <i>Effect of fresh fruit availability at worksites on the fruit and vegetable consumption of low-wage employees</i> US	To examine the impact of fresh fruit availability at worksites on the fruit and vegetable consumption and related psychosocial determinants of low-wage employees	7 apparel manufacturing and 2 food processing worksites A convenience sample of 391 low-wage employees in 6 intervention worksites and 137 low-wage employees in 3 control worksites in Los Angeles, CA	Fresh fruit deliveries with enough for 1 serving per employee, 3 days a week for 12 consecutive weeks. The control worksites did not receive the fruit deliveries Measured F&V consumption using 27 item FFQ	Participants in the intervention worksites showed a significant increase in fruit, vegetables, and total fruit and vegetable consumption, purchasing of fruit, family purchasing of vegetables, and self-efficacy toward eating 2 servings of fruit each day compared to the control worksites	Prospective, randomised block experimental design	Improving access to fruit during the workday can improve fruit and vegetable consumption, purchasing habits, and self-efficacy of low-income employees
Bandoni et al. (2011) <i>Impact of an intervention on the availability and consumption of fruits and vegetables in the workplace</i> Brazil	To evaluate the impact of an educational and environmental intervention on the availability and consumption of fruits and vegetables in workplace cafeterias	Companies of Sao Paulo, Brazil divided into intervention and control groups 29 companies and 2510 workers	The intervention, which focused on change in the work environment, was based on an ecological model for health promotion. It involved several different aspects including menu planning, food presentation and motivational strategies to encourage the consumption of fruits and vegetables Foods consumed – self-reported portion size – individual Cafeteria – data on fruit,	An average increase in the availability of fruits and vegetables of 49 g in the intervention group, an increase of approximately 15 %, whereas the results for the control group remained practically equal to baseline levels During the follow-up period, the intervention group also showed reduced total fat and an increase in fibre in the meals offered. The results showed a slight but still positive increase in the workers' consumption of fruits and vegetables (about 11 g) in the meals offered by the companies	Randomised intervention study	Interventions focused on the work environment can be effective in promoting the consumption of healthy foods

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
			vegetable, energy, protein, carb, fatty acids, fibre available in foods served. Quantities per consumer determined by mean of foods sold			
Barham et al. (2011) <i>Diabetes prevention and control in the workplace: a pilot project for county employees</i> US	Twelve weekly healthy lifestyle sessions based on the Diabetes Prevention Program curriculum, followed by monthly sessions for up to 12 months	Onondaga County employees (n=45) at risk for diabetes (n=35) or with diabetes (n=10) Mean (+/-SD) age=51.2 (+/- 8.0) years and body mass index (BMI)=37.3 +/- (6.8 kg/m)	Outcomes: Medical: Weight, BMI, waist circumference, blood pressure, fasting glucose, lipid, and hemoglobin A1c levels Psychosocial/behavioral: Health-related quality of life (Short Form-12, Impact of Weight on Quality of Life Scale), physical activity (International Physical Activity Questionnaire), eating behavior (3-Factor Eating Questionnaire, National Cancer Institute Fat Screener), job satisfaction	Intervention group lost significant weight compared to the wait control group over the first 3 months (mean [95%CI], -2.23 kg [-3.5 to 0.97]) vs [+ 0.73 kg (+0.17 to +1.28)], with a decrease in BMI (P<.001) and waist circumference (P=.004), an increase in physical activity (P=.011) and lower dietary fat intake (P=.018) Over 12 months, 22.5% (9/40) lost more than 5% body weight and 12.5% (5/40) lost more than 7% body weight After the first 3 months, there was gradual partial weight regain but reduction in waist circumference was maintained The intervention group demonstrated significant improvement in Impact of Weight on Quality of Life Scale (P<.001), 3-Factor Eating (cognitive restraint P<.001, uncontrolled eating P=.003, and emotional eating P=.001), and	Random assignment to begin the program when first offered or after 3 months ('wait control' group)	A worksite intervention program can help government employees adopt healthier lifestyles and achieve modest weight loss

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
				<p>Short Form-12 Physical Component Summary (P=.048)</p> <p>No improvements were observed in blood pressure, lipid, hemoglobin A1c, or glucose levels. Job satisfaction was inversely related to BMI at baseline (P=.001) with a trend for improvement with the modest weight loss</p>		
<p>Byrne et al. (2011)</p> <p><i>Seven-year trends in employee health habits from a comprehensive workplace health promotion program at Vanderbilt University</i></p> <p>The Netherlands</p>	To assess long-term changes in health risks for employees participating in Vanderbilt University's incentive-based worksite wellness program, Health Plus.	Vanderbilt University employees	<p>Health Plus: has a 17,000-square foot fitness facility; provides behaviour change counselling, including health coaching; offers biometric testing; makes available a variety of educational programs, including newsletters, Web tools, video and podcasting, lectures, workshops, and individual consultations; and \$20/ month added to an employee's pay check for completing program</p> <p>Descriptive longitudinal trends were examined for employees' health risk profiles for the period of 2003 to 2009</p>	<p>The majority of risk factors improved over time with the most consistent change occurring in physical activity. The proportion of employees exercising one or more days per week increased from 72.7% in 2003 to 83.4% in 2009</p> <p>Positive annual, monotonic changes were also observed in percentage for non-smokers and seat belt usage</p> <p>Although the largest improvements occurred between the first two years, improvements continued without significant regression toward baseline</p>	Descriptive longitudinal trends (voluntary program)	Provides robust estimates of health improvements that can be achieved through a voluntary incentive-based wellness program

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
<p>Christensen et al. (2011)</p> <p><i>Diet, physical exercise and cognitive behavioral training as a combined workplace based intervention to reduce body weight and increase physical capacity in health care workers: a randomized controlled trial</i></p> <p>Denmark</p>	<p>The present study evaluates the effects of the first 3-months of a 12-month lifestyle intervention among health care workers</p>	<p>98 female, overweight health care workers in western Denmark</p>	<p>Individually dietary plan with an energy deficit of 1200 kcal/day (15 min/hour), strengthening exercises (15 min/hour) and cognitive behavioural training (30 min/hour) during working hours 1 hour/week. Leisure time aerobic fitness was planned for 2 hour/week. The reference group was offered monthly oral presentations</p> <p>Body weight, BMI, body fat percentage (bioimpedance), waist circumference, blood pressure, musculoskeletal pain, fitness</p>	<p>The intervention group significantly reduced body weight with 3.6 kg ($p<0.001$), BMI from 30.5 to 29.2 ($p<0.001$), body fat percentage from 40.9 to 39.3 ($p<0.001$), waist circumference from 99.7 to 95.5 cm ($p<0.001$) and blood pressure from 134/85 to 127/80 mmHg ($p<0.001$), with significant difference between the intervention and control group ($p<0.001$) on all measures</p> <p>No effect of intervention was found in musculoskeletal pain, maximal oxygen uptake and muscle strength, but on aerobic fitness</p>	<p>Cluster randomised single-blinded controlled trial</p>	<p>The results in the intervention group show the great potential of workplace health promotion among this high-risk workgroup</p> <p>Long-term effects of the intervention remain to be investigated</p>
<p>Freak-Poli et al. (2011)</p> <p><i>Impact of a pedometer-based workplace health program on cardiovascular and diabetes risk profile</i></p> <p>Australia</p>	<p>Impact of a pedometer-based workplace health program on cardiovascular and diabetes risk profile</p>	<p>762 adults employed in Melbourne from 10 workplaces in primarily sedentary occupations voluntarily enrolled</p>	<p>The program, Global Corporate Challenge, involves wearing a visible stepcount pedometer with a target of at least 10,000 steps perday for 125 days. Weekly encouragement emails are sent and a website is used for logging daily steps, accessing additional health information, communication amongst participants and comparing team progress. Participation requires an</p>	<p>Improvements between baseline and four-months amongst program participants were observed for physical activity (an increase of 6.5% in the proportion meeting guidelines, OR(95%CI): 1.7(1.1, 2.5), fruit intake (4%, OR: 1.7(1.0, 3.0), vegetable intake (2%, OR: 1.3(1.0, 1.8), sitting time (-0.6(-0.9, -0.3) hours/day), blood pressure (systolic: -1.8(-3.1, -.05) mmHg; diastolic: -1.8(-2.4, -1.3) mmHg) and waist circumference (-1.6(-2.4, -0.7) cm)</p> <p>In contrast, an increase was found</p>	<p>Pre-test, post-test (voluntary program)</p>	<p>One of the few Australian studies</p> <p>Completion of this four-month, pedometer-based, physical activity, workplace program was associated with improvements in behavioural and anthropometric risk factors for diabetes and cardiovascular</p>

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
			<p>employer or employee financial contribution and is typically competitive</p> <p>Baseline and four-month follow-up</p>	for fasting total cholesterol (0.3(0.1, 0.4) mmol/L) and triglycerides (0.1(0.0, 0.1) mmol/L)		<p>disease</p> <p>Long-term evaluation is required to evaluate the potential of such programs to prevent the onset of chronic disease</p>
<p>Freak-Poli et al. (2011)</p> <p><i>Participant characteristics associated with greater reductions in waist circumference (WC) during a four-month, pedometer-based, workplace health program</i></p> <p>Australia</p>	Impact of a pedometer-based workplace health program on waist circumference	762 adults employed in Melbourne from 10 workplaces in primarily sedentary occupations voluntarily enrolled	Same intervention – changes in waist circumference=outcome	<p>Greater improvement in WC during the program was associated with having completed tertiary education, consuming two or less standard alcoholic beverages in one occasion in the twelve months prior to baseline, undertaking less baseline weekend sitting time and lower baseline total cholesterol</p> <p>A greater WC at baseline was strongly associated with a greater improvement in WC. A sub-analysis in participants with a 'high-risk' baseline WC revealed that younger age, enrolling for reasons other than appearance, undertaking less weekend sitting time at baseline, eating two or more pieces of fruit per day at baseline, higher baseline physical functioning and lower baseline body mass index were associated with greater odds of moving to 'low risk' WC at the end</p>	Pre-test, post-test (Voluntary program)	<p>These results indicate that employees who started with better health, potentially due to lifestyle or recent behavioural changes, were more likely to respond positively to the program</p> <p>Future health program initiators should think innovatively to encourage all enrollees along the health spectrum to achieve a successful outcome</p>

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
				of the program		
<p>Groeneveld et al. (2011)</p> <p><i>Short and long term effects of a lifestyle intervention for construction workers at risk for cardiovascular disease: a randomized controlled trial</i></p> <p>US</p>	<p>Short and long term effects of a lifestyle intervention for construction workers at risk for cardiovascular disease</p> <p>Participants chose to aim at either diet and PA, or smoking</p>	816 male blue- and white-collar workers in the construction industry with an elevated risk of CVD	<p>Intervention consisted of individual counselling using motivational interviewing techniques, and was delivered by an occupational physician or occupational nurse. In 3 face to face and 4 telephone contacts, the participant's risk profile, personal determinants, and barriers for behaviour change were discussed, and personal goals were set.</p> <p>Usual care was compared to a 6-month lifestyle intervention</p> <p>Data were collected at baseline and after six and 12 months, by means of a questionnaire</p>	<p>The intervention had a statistically significant beneficial effect on snack intake (beta -1.9, 95%CI -3.7; -0.02) and fruit intake (beta 1.7, 95%CI 0.6; 2.9) at 6 months</p> <p>The effect on snack intake was sustained until 12 months; 6 months after the intervention had ended (beta -1.9, 95%CI -3.6; -0.2)</p> <p>The intervention effects on leisure time PA and metabolic equivalent-minutes were not statistically significant</p> <p>The beneficial effect on smoking was statistically significant at 6 (OR smoking 0.3, 95%CI 0.1;0.7), but not at 12 months (OR 0.8, 95%CI 0.4; 1.6)</p>	Randomised controlled trial	<p>Beneficial effects on smoking, fruit, and snack intake can be achieved by an individual-based lifestyle intervention among male construction workers with an elevated risk of CVD</p> <p>Future research should be done on strategies to improve leisure time PA and on determinants of maintenance of changed behaviour</p>
<p>Hess et al. (2011)</p> <p><i>Workplace nutrition and physical activity promotion at Liverpool Hospital</i></p> <p>Australia</p>	<p>A 12-week program was conducted to increase physical activity and healthy eating. Participants received a pedometer, healthy cookbook, water bottle, sandwich container and Measure Up campaign resources</p>	399 employees of Liverpool Hospital, NSW	A web-based survey was completed at baseline and follow up	<p>Sixty-six per cent of participants completed the follow-up survey. Those that did not complete the follow-up evaluation were not significantly different to completers</p> <p>Respondents reported a significant increase in median minutes walked to 200 minutes and in vigorous physical activity to 85 minutes over the previous week</p>	Pre-test, post-test	<p>Australian study</p> <p>With some improvements to processes, further similar programs with the health sector workforce is encouraged</p>

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
				Participants consuming adequate fruit and vegetable per day increased by 24.7% and 22.7%, respectively. More participants also consumed breakfast on seven days of the week and consumed one or more litres of water per day		
<p>Hughes et al. (2011)</p> <p><i>Comparison of two health-promotion programs for older workers</i></p> <p>US</p>	<p>Participants were categorised into 3 study arms:</p> <ol style="list-style-type: none"> 1. the COACH intervention combined Web-based risk assessments with personal coaching support 2. the RealAge intervention used a Web-based risk assessment and behaviour-specific modules, and 3. a control group received printed health-promotion materials 	423 participants aged 40 years and older	Random-effects modelling controlled for baseline stage of change for all behaviours of interest in all groups	<p>At 6 and 12 months, COACH participants showed significantly increased fruit and vegetable consumption ($P=.026$; $P<.001$) and participation in physical activity ($P=.05$; $P=.013$), and at 12 months they showed decreased percentage of energy from fat ($P=.027$)</p> <p>RealAge participants showed significantly decreased waist circumference at 6 and 12 months ($P=.05$; $P=.018$)</p> <p>Overall, COACH participants were twice as likely to use the COACH intervention as RealAge participants were to use the RealAge intervention. COACH participants experienced twice the number of positive outcomes that control participants experienced</p>	Prospective, randomised controlled trial	<p>Web-based risk assessments are useful when combined with follow-up support that is either web-based or personal coaching</p> <p>However, personal coaching was more attractive to workers than web-based educational modules as follow-up support so greater participation rates and adherence are likely in a program offering personal, face-to-face support</p>

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
<p>Irvine et al. (2011)</p> <p><i>Get Moving: A web site that increases physical activity of sedentary employees</i></p> <p>US</p>	<p>Get Moving was a repeat-visit Web site providing information and support to develop a personalised PA plan</p>	<p>221 workers; (average body mass index was 29.5) from large manufacturing plant</p>	<p>Self-reported: PA, depression, anxiety, stage of change, attitudes, knowledge, self-efficacy, intention, perceived barriers to PA, and motivation</p>	<p>Compared with the control group, the treatment group showed significant improvement</p> <p>The multivariate test was significant (p .001), with a large effect size (g25.42).</p> <p>The treatment group differed significantly from the control participants on 11 outcomes (p .005), with large effect sizes for PA status, min/d, and knowledge, attitudes, and behavioural intention</p> <p>Medium effect sizes were measured for perceived barriers, depressive symptoms, motivation, and self-efficacy</p> <p>Multiple visits resulted in significantly improved PA, motivation, self-efficacy, and intention, compared with one-time visits</p>	<p>Randomised control design with 30-day follow-up</p>	<p>Interventions Web site have potential to increase the PA of sedentary individuals in worksites and elsewhere, but more research is needed into mediators of Web-based interventions</p>

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
John et al. (2011) <i>Treadmill workstations: a worksite physical activity intervention in overweight and obese office workers</i> US	A 9-month study to determine if a treadmill-workstation (TMWS) increases physical activity (PA) and influences anthropometric, body composition, cardiovascular, and metabolic variables in overweight and obese office-workers	Twelve (mean age= 46.2 +/- 9.2 years) overweight/obese sedentary office-workers (mean BMI=33.9 +/- 5.0 kg.m-2)	TMWS were installed in the participants' offices for their use Measurements of postural allocation, steps per day, anthropometric variables, body composition, cardiovascular, and metabolic variables, were completed at baseline and repeated after 3 and 9 months	Between baseline and 9 months, significant increases were seen in the median standing (146–203 min.day-1) and stepping time (52–90 min.day-1) and total steps/day (4351–7080 steps/day; P<.05). Correspondingly, the median time spent sitting/lying decreased (1238–1150 min.day-1; P<.05). Using the TMWS significantly reduced waist (by 5.5 cm) and hip circumference (by 4.8 cm), low-density lipoproteins (LDL) (by 16 mg.dL-1), and total cholesterol (by 15 mg.dL-1) during the study (P<.05)	Pre-test, post-test	The additional PA energy expenditure from using the TMWS favourably influenced waist and hip circumferences and lipid and metabolic profiles in overweight and obese office-workers
Lassen et al. (2011) <i>Improving the diet of employees at blue-collar worksites: results from the 'Food at Work' intervention study</i> Denmark	To examine the impact of a 6-month participatory and empowerment-based intervention study on employees' dietary habits and on changes in the canteen nutrition environment. The study was carried out in partnership with a trade union and guided by an ecological framework targeting both individual and environment levels	Employees from eight blue-collar worksites (5 with canteens) Intervention group (n=102, 5 worksites) Minimum intervention control group (3 worksites)	Outcome measures included: (i) changes in employees' dietary habits derived from 4 d pre-coded food diaries of a group of employees at the worksites (paired-data structure); and (ii) the canteen nutrition environment as identified by aggregating chemical nutritional analysis of individual canteen lunches (different participants at baseline and at endpoint)	In the intervention group, several significant positive nutritional effects were observed among employees, including a median daily decrease in intake of fat (-2.2 %E, P=0.002) and cake and sweets (-18 g/10 MJ, P=0.002) and a median increase in intake of dietary fibre (3 g/10 MJ, P<0.001) and fruit (55 g/d, P=0.007 and 74 g/10 MJ, P=0.009) With regard to the canteen nutrition environment, a significant reduction in the percentage of energy obtained from fat was found in the intervention group (median difference 11 %E, P<0.001, n=144)	Worksites were stratified by company type and by the presence or absence of an in-house canteen, and randomly allocated to either an intervention group or a minimum intervention control group	Moderate positive changes in dietary patterns can be achieved among employees in blue-collar worksites

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
<p>McEachan et al. (2011)</p> <p><i>Testing a workplace physical activity intervention: a cluster randomized controlled trial</i></p> <p>UK</p>	To explore the impact and cost-effectiveness of a workplace physical activity intervention designed to increase physical activity levels	1260 participants from 44 UK worksites (based within 5 organisations) were recruited	<p>The intervention consisted of a 3 month tool-kit of activities targeting components of the Theory of Planned Behaviour, delivered in-house by nominated facilitators</p> <p>Measurements at baseline, and at 0 months, 3 months and 9 months post-intervention</p>	<p>Multi-level modelling found no significant effect of the intervention on MET minutes of activity (from the IPAQ) at any of the follow-up time points controlling for baseline activity</p> <p>However, the intervention did significantly reduce systolic blood pressure (B=-1.79 mm/Hg) and resting heart rate (B=-2.08 beats) and significantly increased body mass index (B=.18 units) compared to control</p> <p>The intervention was found not to be cost-effective, however the substantial variability round this estimate suggested that further research is warranted</p>	Cluster randomised controlled trial	<p>The study found mixed support for this worksite physical activity intervention</p> <p>There are tensions involved in conducting rigorous evaluations of large-scale randomised controlled trials in real-world settings</p>
<p>Merrill et al. (2011)</p> <p><i>Effectiveness of a workplace wellness program for maintaining health and promoting healthy behaviours</i></p> <p>US</p>	The effectiveness of a worksite wellness program	3737 continuously employed workers at a large agribusiness during 2007–2009	A wellness program called <i>Reaping Rewards</i> has been offered to employees. Reaping Rewards includes physical examinations, activities like educational lunch programs focused on nutrition, fitness, and related topics; screenings; classes in cardiopulmonary resuscitation and first aid; aerobic exercise and strength-training classes; and other programs that	<p>Clinically significant improvements occurred in those who were underweight, those with high systolic or diastolic blood pressure, high total cholesterol, high low-density lipoprotein, low high-density lipoprotein, high triglycerides, and high glucose. Among obese employee participants, significant improvements occurred in selected mental health and dietary variables</p> <p>Among those who lowered their</p>	Within-group study design	<p>The current program was most effective among those with poorer health status at baseline</p> <p>Failure to have a distinct comparison group limited an evaluation of the efficacy of the monetary</p>

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
			<p>promote wellness/healthy behaviours</p> <p>Participation in the program can earn points that can be exchanged for cash up to an annual maximum of \$250</p>	<p>BMI, significant decrease occurred in fat intake, and significant increase resulted in weekly aerobic exercise and feelings of calmness and peace, happiness, ability to cope with stress, and more physical energy</p>		<p>incentive structure for encouraging participation</p>
<p>Merrill et al. (2011)</p> <p><i>Effectiveness of a worksite wellness program on health behaviors and personal health</i></p> <p>US</p>	<p>To evaluate the effectiveness of a worksite wellness program at improving health behaviour and personal health</p>	<p>472 (71% men and 29% women) workers employed in 2009 through 2010 in a small business company</p>		<p>Participants showed significant improvement in frequency of exercise, consumption of whole grains, vegetables and fruits, restful sleep, and seat belt use</p> <p>Life satisfaction and perceived health also significantly increased, but job satisfaction significantly decreased (GFC) and there was no change in smoking or body mass index</p> <p>In addition, the percentage with borderline/high blood pressure significantly decreased</p>	<p>No comparison group who did not complete the program, so cannot fully rule out the influence of unmeasured factors on the results</p>	<p>Employees were volunteers – selection bias</p> <p>This type of wellness program appears to help employees develop and maintain healthy behaviours</p>
<p>Morgan et al. (2011)</p> <p><i>Efficacy of a workplace-based weight loss program for overweight male shift workers: the Workplace POWER (Preventing Obesity</i></p>	<p>The 3-month program involved one information session, program booklets, group-based financial incentives and an online component</p>	<p>110 overweight/ obese (BMI 25-40) (mean [SD] age=44.4 [8.6] years; BMI=30.5 [3.6]) male employees at Tomago Aluminium aged 18-65 randomised in October 2009</p> <p>Men were randomised to either:</p>	<p>Men were assessed at baseline and at 14-week follow-up for weight (primary outcome), waist circumference, BMI, blood pressure, resting heart rate, self-reported physical activity and dietary variables, and physical activity and dietary cognitions</p>	<p>Intention-to-treat analysis using linear mixed models revealed significant between group differences for weight loss after 14 weeks ($P<.001$, Cohen's $d=0.34$)</p> <p>Significant intervention effects were also found for waist circumference ($P<.001$, $d=0.63$), BMI ($P<.001$, $d=0.41$), systolic blood pressure ($P=.02$, $d=0.48$), resting heart rate</p>	<p>A prospective, two-armed randomised controlled trial</p>	<p>The Program was feasible and efficacious and resulted in significant weight loss and improved health-related outcomes and behaviours in overweight male shift workers</p>

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
<i>Without Eating like a Rabbit)</i> <i>randomized controlled trial</i> US		1. WP program (n=65) or 2. 14-week wait-list control group (n=45).		($P<.001$, $d=0.81$), physical activity ($P=.03$, $d=0.77$), sweetened beverages ($P<.02$, $d=0.5-0.6$) and physical activity-related cognitions ($P<.02$, $d=0.6$)		
Neville et al. (2011) <i>Longitudinal outcomes of a comprehensive incentivized worksite wellness program</i> US	Health benefits of long-term participation in an employer-based wellness program, focusing on selected chronic disease risk factors		Study was conducted of 8 years of existing prospectively collected annual data, including clinical measures of weight, blood pressure, cholesterol, and body fat per cent Participants were divided into their risk levels at baseline Outcomes were compared to level of participation, for which annual points earned was a surrogate	Participants had lower increases in body mass index (BMI) than the general population had during the same time period Greatest improvements in BMI, blood pressure, and cholesterol were seen in those at highest risk levels at baseline and in those whose physical activity increased over time Long-term participation in this program improved BMI, blood pressure, and cholesterol. Most benefits were found for those in high-risk groups	A repeated measures longitudinal time-series study	This program should recruit more employees in high health risk categories and emphasize retention and increased levels of participation
Osayi, Ovbiosa-Akinbosoye & Long (2011) <i>Factors associated with long-term weight loss and weight maintenance analysis of a</i>	To examine factors associated with long-term weight loss and maintenance for participants of a comprehensive workplace wellness program	89,746 overweight and obese persons between 2005 and 2010	Health Risk Assessments completed by participants to examine the association between demographics, improved nutrition, improved exercise and reduced stress and odds of weight loss and weight maintenance, as well as changes in bodyweight at 1 year follow-up	Factors significantly associated with increased odds and amount of weight loss were male gender, older age, reduced psychosocial stress, improved nutrition, and increased exercise when combined with improved nutrition.		Comprehensive workplace wellness programs that address weight management through an integrated stress management approach can be effective in

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
<i>comprehensive workplace wellness program</i> US						addressing the obesity epidemic
Scoggins et al. (2011) <i>Short-term and long-term weight management results of a large employer-sponsored wellness program</i> US	To evaluate the weight management results of Healthy Incentives, an employer-sponsored wellness program started in 2006 by King County, Washington	King County, Washington employees	<p>Healthy IncentivesSM</p> <p>To achieve gold status, the lowest out-of-pocket expense option, members complete Health Risk Assessment (HRAs), and 10-week individual action plans targeting health risks identified in the HRA</p> <p>Programs and tools emphasizing healthy eating, stress management, and weight management</p> <p>Changes to the environment</p> <p>Body mass index (BMI) and the percentages of those who lost 5% and 10% compared for first-year participants, 5-year participants, and respondents to the Medical Expenditures Panel Survey</p> <p>Weight and height data were self-reported</p>	<p>A total of 19,559 first-year participants lost weight on average, while the comparative MEPS - commonly used as a general population comparison group in national studies) sample gained weight, -0.80% versus 0.31% (P<0.01)</p> <p>A total of 10,432 5-year participants also lost weight on average but not as much as during the first year, -0.47% versus -0.80% (P=0.01)</p> <p>More obese first-year participants lost 5% of BMI than the MEPS sample, 28.5% versus 23.2% (P<0.01). Thirty eight percent of obese 5-year participants lost 5%</p>	Prospective Voluntary program	Healthy Incentives achieved significant weight management benefits for both first-year and 5-year participants

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
<p>Tamers et al. (2011)</p> <p><i>The association between worksite social support, diet, physical activity and body mass index</i></p> <p>US</p>	<p>To evaluate the relationship between worksite social support and dietary behaviours, physical activity, and body mass index (BMI)</p>	<p>2878 employees from 2005 to 2007 from 34 worksites in Greater Seattle</p>	<p>Intervention: Promoting Activity and Changes in Eating, a weight reduction intervention</p> <p>Worksite social support, diet, physical activity, and BMI were assessed via self-reported questionnaire</p>	<p>No associations were found with worksite social support and BMI, or with many obesogenic behaviours</p> <p>However, individuals with higher worksite social support had 14.3% higher (95%CI: 5.6%–23.7%) mean physical activity score and 4% higher (95%CI: 1%–7%) mean fruit and vegetable intake compared to individuals with one-unit lower support</p>	<p>Group-randomised intervention</p>	<p>A conclusive relationship between higher worksite social support and all obesogenic behaviours not observed, with the exception of PA and F&V intake</p> <p>Future studies are needed to confirm these relationships and evaluate how worksite social support impacts outcomes</p>
<p>Terry et al. (2011)</p> <p><i>Effectiveness of a worksite telephone-based weight management program</i></p> <p>US</p>	<p>Individually tailored telephone-based weight management coaching program that included up to five calls over a median of 250 days</p>	<p>Overweight or obese participants (n=1298) enrolled in a telephone-based weight management program from ten large private-sector and public-sector employers</p>	<p>NextSteps weight management program was a personalised, telephone-based program designed to guide participants in identifying barriers, setting goals, developing action plans, and gaining social support to establish and maintain health-promoting behaviour change</p> <p>Weight, BMI, and lifestyle behaviours assessed via health risk assessment at baseline and 1-year follow-up</p>	<p>Among weight management program participants, 48% of program completers and 47% of non-completers lost weight, but program completers averaged 2.6 times more weight loss than non-completers</p> <p>Improvements in physical activity, eating habits, and overall health status were reported for completers</p>	<p>Pre/post quasi-experimental design</p>	<p>Findings suggest that a telephone-based weight management program of modest intensity can have a positive impact on the health of obese or overweight worksite participants</p>

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
Tucker et al. (2011) Effects of a worksite physical activity intervention for hospital nurses who are working mothers	This study aimed to develop and test an innovative 10-week worksite physical activity intervention integrated into the work flow of hospital-based nurses who were mothers	Three volunteer adult medical-surgical nursing units participated as intervention units. Fifty-eight nurses (30 intervention and 28 control)	Baseline and post-intervention repeated measurements of physical activity (steps) and body composition Intervention participants provided post-intervention focus group feedback	For both groups, daily steps averaged more than 12,400 at baseline and post-intervention No significant effects were found for physical activity; significant effects were found for fat mass, fat index, and percent fat ($p < .03$) Focus group findings supported the intervention and other data collected	Volunteer nursing units	The worksite holds promise for targeting the health of working mothers Future research is warranted with a larger sample, longer intervention, and additional measures
Verweij et al. (2011) <i>Process Evaluation of an Occupational Health Guideline Aimed at Preventing Weight Gain Among Employees</i> The Netherlands	To evaluate the process of an occupational health guideline aimed at preventing weight gain	Employees ($n=274$)	The guideline consists of an environmental component for which occupational physicians (OPs) provide advice to employers on how to assess and intervene on the obesogenic work environment, and an individual component describing how OPs can promote physical activity and healthy dietary behaviour of employees, during five counselling sessions within 6 months. Evaluation and maintenance by OPs of intervention components Quantitative data on seven process items were assessed	Occupational physicians ($n = 7$) implemented the guideline partly with respect to the environmental level, but performed well at the individual level Behavioural change counselling was performed 'to some extent'. Employees showed high reach (86%), satisfaction (7.1), and attendance rates (4.4 of 5 sessions). Significant effects were found on waist circumference (-1.5 cm to -2.1 cm) and body weight (-0.9 kg to -1.4 kg) among employees with higher attendance and satisfaction rates	Randomised controlled trial	Workplace health promotion via an occupational health guideline is feasible, but the environmental component and behavioural change counselling need revisions before practical application

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
			and linked to effects on employees' waist circumference and body weight at 6 months			
Yoon et al. (2011) <i>Evaluation of an incentive-based obesity management program in a workplace</i> US	To examine the effectiveness of an incentive-based obesity management program (the Midas Project aimed to improve good health habits)	95 electronics company participants with a high body mass index (BMI) were recruited in 2005	A health promotion program for 3 months that awarded gold medals as an incentive for body fat loss	<p>BMI decreased from 28.8 to 27.8 kg/m² (p=.000), body weight decreased from 87.2 to 83.5 kg (p=.000), and body fat weight decreased from 25.4 to 23.3 kg (p=.000)</p> <p>Systolic and diastolic blood pressure decreased from 130.5 to 125.1 mmHg (p=.002), from 86.4 to 81.7 mmHg (p=.009)</p> <p>Participants exercising more than 3 times per week increased from 27.3% to 52.3% (p=.000)</p> <p>The percentage who avoided overeating at parties and midnight eating increased from 65.9 to 72.7% (p=.767) and 70.5 to 84.1% (p=.172), respectively</p>		This incentive-based obesity management program was effective in improving not only BMI but also health status
2010						
Borg et al. (2010) <i>Staff walking program: a quasi-experimental trial of maintenance newsletters to</i>	The Step by Step self-help walking program plus a pedometer previously motivated a community sample of adults to be physically active for up to three	Staff defined as inactive received the 3 month walking program and a pedometer (standard), or the 3 month program plus four	Measures included changes in self-reported minutes walking, minutes of moderate-vigorous physical activity (MVPA), total physical activity (PA) in the past week, and the	<p>Significant increases on all outcome measures were noted for all participants</p> <p>There were no between group differences in walking minutes. However, the change in MVPA</p>	Quasi-experimental trial	Dissemination of the Step by Step guidebook with pedometers in the workplace resulted in a long-term increase in PA of

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
<i>maintain walking following a pedometer program</i> US	months This study evaluated the effect of enhancement of this program over an additional nine months in a workplace	maintenance newsletters over nine months (standard+ maintenance)	proportion meeting public health recommendations by walking and total PA Follow-up interview at 12 months	minutes was significantly higher in the standard+maintenance group compared with the standard group (118 min vs. 69 min, $P=0.029$) No significant between group differences were observed for total PA (161 min vs. 117 min, $P=0.187$). Wearing the pedometer at the month of the follow-up interview, and thinking that the pedometer was very useful, increased the likelihood of meeting public health recommendations (AOR=2.7 and 2.5) adjusting for other covariates		inactive employees with no extra support. Newsletters as a maintenance strategy had no additional benefits Better outcomes were noted if the pedometer was used and this was perceived as being very useful
De Cocker et al. (2010) <i>The effect of a multi-strategy workplace physical activity intervention promoting pedometer use and step count increase</i> Europe	Evaluated the effects of a 20-week pedometer-based PA workplace intervention	Intervention worksite (68 participants at follow-up) Comparison workplace (79 participants at follow-up)	Pedometer-based and self-reported PA from one intervention worksite was compared with the data of a comparison workplace	A downward trend in overall step counts from baseline (end of summer) to follow-up (winter) was found ($F=3.3$, $P=0.071$). However, the intervention effect revealed a significant smaller decrease in the intervention workplace (-618 steps/day) than in the comparison workplace (-1389 steps/day) ($F=8.8$, $P=0.004$) This intervention effect was only present in already active participants, reaching 10 000 steps/day at baseline (intervention participants: -1706 steps/day; comparison participants: -4006 steps/day) ($F = 5.5$, $P=0.023$).	Quasi-experimental study (comparison worksite)	Future workplace projects should give extra attention to inactive employees

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
				Overall project awareness was very high (97%) and the intervention strategies were judged 'good to very good' by 57–95% of the participants. However, the proportion of intervention participants reporting that they had changed their PA behaviour because of the intervention (31%) and reporting that they had used the pedometer during the intervention (48%) was limited		
French et al. (2010) <i>Worksite environment intervention to prevent obesity among metropolitan transit workers</i> US	18-month worksite intervention to prevent obesity among metropolitan transit workers	4 garages in a major metro area randomised to intervention or control	Intervention program components at the garage included enhancement of the physical activity facilities, increased availability of and lower prices on healthy vending machine choices, and group behavioural programs Data were collected during the fall of 2005 pre-intervention and during the fall of 2007 post-intervention	Measurement participation rates were 78% at baseline and 74% at follow-up The intervention effect on garage mean BMI change was not significant (-0.14 kg/m(2)) Energy intake decreased significantly, and fruit and vegetable intake increased significantly in intervention garages compared to control garages Physical activity change was not significant	Randomised intervention pre-post-	Worksite environmental interventions for nutrition and physical activity behaviour change may have limited impact on BMI among transit workers who spend most of their workday outside the worksite
Funk et al. (2010) <i>Associations of internet website use with weight change in a long-</i>	The Weight Loss Maintenance Trial (WLM) compared two long-term weight-maintenance interventions, a	Adults at risk for cardiovascular disease (CVD) who lost at least 4 kilograms in an initial 20-week group-based, behavioural weight-loss	Participants were encouraged to log in at least weekly and enter a current weight for the 30-month study period. The website contained features that	Participants in the consistent user group (n=212) were more likely to be older (P=.002), other than African American (P=.02), and more educated (P=.01)	Observational	Participants defined as consistent website users of an interactive behavioural

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
<i>term weight loss maintenance program</i> US	<p>personal contact arm and an Internet arm, with a no-treatment control after an initial six-month Phase I weight loss program. The Internet arm focused on use of an interactive website for support of long-term weight maintenance.</p> <p>This paper presents a secondary analysis of the subset of participants in the Internet arm and focuses on website use patterns and features associated with long-term weight maintenance</p>	<p>program were trained to use an interactive website for weight loss maintenance (n=348).</p> <p>37% were male and 38% were African American. Mean weight loss was 8.6 kilograms.</p>	<p>encouraged setting short-term goals, creating action plans, and reinforcing self-management habits. The website also included motivational modules, daily tips, and tailored messages. Based on log-in and weight-entry frequency, we divided participants into three website use categories: consistent, some, and minimal.</p>	<p>While there was no significant difference between website use categories in the amount of Phase I change in body weight ($P=.45$) or income ($P=.78$), minimal website users (n=75) were significantly more likely to have attended fewer Phase I sessions ($P=.001$) and had a higher initial body mass index (BMI) ($P<.001$)</p> <p>After adjusting for baseline characteristics including initial BMI, variables most associated with less weight regain included: number of log-ins ($P=.001$), minutes on the website ($P<.001$), number of weight entries ($P=.002$), number of exercise entries ($P<.001$), and sessions with additional use of website features after weight entry ($P=.002$)</p>		<p>website designed to promote maintenance of weight loss were more successful at maintaining long-term weight loss</p>
Meyer et al. (2010) <i>Stairs instead of elevators at workplace: cardio-protective effects of a pragmatic intervention</i> US	<p>A 12-week promotional campaign for stair use consisting in posters and floor stickers at the point of choice between stairs and elevators at each hospital floor was organized in a university hospital building</p>	<p>77 selected university hospital employees with an inactive lifestyle</p>	<p>Physical activity, aerobic fitness, anthropometrics, blood pressure, lipids, insulin sensitivity, and C-reactive protein were assessed at baseline, 12 weeks, and 6 months</p>	<p>During the intervention median daily number of ascended and descended one-story staircase units was 20.6/day (14.2–28.1) compared with 4.5/day (1.8–7.2) at baseline ($P<0.001$)</p> <p>At 12 weeks, estimated maximal aerobic capacity had increased by $9.2\pm 15.1\%$ ($P<0.001$) corresponding with approximately 1 MET</p>	Pre and post intervention study	<p>Encouraging stair use at work is effective for improving fitness, body composition, blood pressure, and lipid profile in asymptomatic individuals with an inactive lifestyle and thus may be a simple way to</p>

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
				<p>Significant declines in waist circumference (-1.7+/-2.9%), weight (-0.7+/-2.6%), fat mass (-1.5+/-8.4%), diastolic blood pressure (-1.8+/-8.9%), and low-density lipoprotein cholesterol (-3.0+/-13.5%)</p> <p>At 6 months, the median daily number of ascended and descended one-story staircase units had decreased to 7.2 (3.5–14.0). Benefits on estimated maximal aerobic capacity (+5.9+/-12.2%, P=0.001) and fat mass (-1.4+/-8.4%, P=0.038) persisted</p>		significantly reduce cardiovascular disease risk at the population level
<p>Pressler et al. (2010)</p> <p><i>An internet-delivered exercise intervention for workplace health promotion in overweight sedentary employees: a randomized trial</i></p> <p>Germany</p>	To evaluate the effect of structured vs. non-structured internet-delivered exercise recommendations on aerobic exercise capacity and cardiovascular risk profile in overweight sedentary employees	140 employees of an automobile company (11% female, median age 48 years (range 25–60), BMI 29.0 kg/m ² (25.0–34.8)) were randomized in a 3:2 ratio to an intervention group or a control group in Munich, Germany, 2008	<p>Intervention group received structured exercise schedules and control group chose workouts individually via an interactive website 12-week intervention</p> <p>Main outcome measure was performance at the lactate anaerobic threshold (P(AT)/kg) during ergometry</p>	<p>77 participants completed the study</p> <p>The intervention group (n=50) improved significantly in P(AT)/kg ((mean (SD)) 1.68 (0.31) vs. 1.81 (0.33) W/kg; p=0.002), VO₂peak (3.21 (0.63) vs. 3.35 (0.74) L/min; p=0.04), and waist circumference (100.5 (7.9) vs. 98.0 (7.8) cm; p=0.001)</p> <p>The control group (n=27) improved significantly in P(AT)/kg (1.59 (0.38) vs. 1.80 (0.49); p<0.001) and waist circumference (101.9 (8.7) vs. 98.3 (8.5) cm; p<0.001), but not in VO₂peak</p>	Randomised trial	<p>Structured, internet-delivered exercise recommendations are not superior to internet-delivered non-structured exercise recommendations in a workplace setting</p> <p>Both lifestyle intervention strategies are, however, limited by high dropout</p>

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
				No significant between group differences in these outcome measures were noted		rates
<p>Siegel et al. (2010)</p> <p><i>A worksite obesity intervention: results from a group-randomized trial</i></p> <p>US</p>	<p>Used a participatory process to develop an obesity intervention appropriate for elementary school personnel</p>	<p>16 school worksites (8 intervention, 8 control)</p>	<p>Intervention schools formed committees to develop and implement health promotion activities for employees</p> <p>Anthropometric and self-report data were collected at baseline and post-intervention (2 years later)</p> <p>The primary outcome measures were body mass index (BMI), waist-hip ratio, physical activity, and fruit and vegetable consumption</p>	<p>After adjustment for age, ethnicity, and job classification, employees in intervention schools reduced their BMI by an average of 0.04 kg/m², and those in control schools increased their BMI by an average of 0.37 kg/m²</p> <p>Comparisons for waist-hip ratio, weekly physical activity minutes, and fruit and vegetable consumption were not significant</p>	<p>Group-randomised controlled trial</p>	<p>The participatory process appeared to be an effective means for stimulating change</p> <p>The intervention may have slowed and perhaps reversed the tendency of adults to gain weight progressively with age</p>
<p>Taylor et al. (2010)</p> <p><i>The Booster Break program: description and feasibility test of a worksite physical activity daily practice</i></p> <p>US</p>	<p>The Booster Break program is a co-worker led physical activity group session devoted exclusively to standard 15-minute work breaks</p> <p>The purpose of this study was to report the fidelity, attendance, feasibility, and sustainability of the Booster Break program and to explore its potential impact</p>	<p>Small business that provides legal and court reporting services to lawyers. The organisation has 14 employees (8 women and 6 men), from 32 to 66 years of age.</p>	<p>For six months, this small business implemented the Booster Break program. Booster Break facilitators conducted the group sessions according to protocol, which included describing, cueing, and executing the physical activity sequence</p>	<p>During the six month period, 117 sessions were conducted. The average monthly attendance ranged from 76% to 86%</p> <p>Participants significantly improved HDL cholesterol (p=0.04) and lost an average of 14 pounds</p>		<p>The Booster Break (15 mins work breaks) program is a feasible physical activity program for small business settings</p>

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
<p>Thorsen et al. (2010)</p> <p><i>Long-term sustainability of a worksite canteen intervention of serving more fruit and vegetables</i></p> <p>Denmark</p>	<p>To analyse the 5-year sustainability of a worksite canteen intervention of serving more fruit and vegetables (F&V)</p> <p>The intervention used a participatory and empowering approach, self-monitoring and networking among the canteen staff, management and a consultant. The method focused on providing ideas for increased F&V for lunch, making environmental changes in the canteens by giving access to tasteful and healthy food choices and reducing the availability of unhealthy options</p>	<p>Worksite canteen managers, canteen staff from five Danish worksites serving from 50 to 500 meals a day: a military base, an electronic component distributor, a bank, a town hall and a waste-handling facility</p>	<p>Average F&V consumption per customer per meal per day was assessed in five worksite canteens by weighing F&V served and subtracting waste. Data were collected by the canteen staff during a 3-week continuous period and compared to data from the same five canteens measured at baseline, at end point and at 1-year follow-up</p>	<p>Four of the five worksite canteens were able to either maintain the intervention or even increase the consumption of F&V</p> <p>The average increase from baseline to 5-year follow-up was 95 g per customer per meal per day (18, 144, 66, 105 and 141 g, respectively)</p> <p>On average, the five canteens at the long-term follow-up had an F&V consumption of 208 g/meal per customer</p>	<p>Pre-post – across worksites</p>	<p>The present study indicates that sustainability of F&V is possible in worksites where the participatory and empowering approach, self-monitoring, environmental change, dialogue with suppliers and networking among worksite canteens are applied</p>

Paper	Study description	Study population	Intervention	Study findings	Quality/ level of evidence	Recommendations or implications
<p>Touger-Decker et al. (2010)</p> <p><i>Workplace weight loss program; comparing live and internet methods</i></p>	<p>To determine the effectiveness of the 12-week workplace intervention (WIP) on energy intake, weight, physical activity (PA) and cardiovascular disease (CVD) risk and the effect of delivery method on outcomes</p>	<p>Subjects included overweight/ obese academic health science centre employees</p>	<p>A 12-week WIP comparing In-person and Internet-based delivery</p> <p>All subjects received identical intervention with dietitian visits at baseline and weeks 6, 12 and 26</p> <p>Changes in weight, PA and CVD-risk were primary outcomes</p>	<p>There was no significant treatment effect</p> <p>Within subjects, significant main effects indicating improvement were noted at week-12 in weight, WC, body-fat, HRQOL and energy intake and at week-26 in weight, WC, body-fat, HRQOL, energy intake and systolic and diastolic BP</p>	<p>Prospective clinical trial</p>	<p>Improvements in some outcomes following a 12-week workplace intervention were independent of delivery method</p>
<p>Warren et al. (2010)</p> <p><i>Small Steps Are Easier Together: a goal-based ecological intervention to increase walking by women in rural worksites</i></p> <p>US</p>	<p>Small Steps Are Easier Together (SmStep) was a locally-instituted, ecologically based intervention to increase walking by women</p>	<p>Participants were recruited from 10 worksites in rural New York State in collaboration with worksite leaders and Cooperative Extension educators</p>	<p>Worksite leaders were oriented and chose site specific strategies</p> <p>Participants used pedometers and personalised daily and weekly step goals. Participants reported steps on web logs and received weekly e-mail reports over 10 weeks in 2008</p>	<p>Of 188 enrollees, 114 (61%) reported steps. Weekly goals were met by 53% of reporters</p> <p>Intention to treat analysis revealed a mean increase of 1503 daily steps. Movement to a higher step zone over their baseline zone was found for: 52% of the sedentary (n=80); 29% of the low active (n=65); 13% of the somewhat active (n=28); and 18% of the active participants (n=10). This placed 36% of enrollees at the somewhat active or higher zones (23% at baseline, $p<0.005$)</p>	<p>Pre- post across worksites</p>	<p>Female workers increased walking steps through a goal-based intervention in rural worksites</p> <p>The SmStep intervention provides a model for a group-based, locally determined, ecological strategy to increase worksite walking supported by local community educators and remote messaging using email and a web site</p>

Appendix 2: Additional information pertaining to workplace interventions

Best practice elements of workplace health promotion (at the individual organisation or program level)

While health and wellbeing programs are flourishing in the workplace and the breadth of the programs being implemented is wide, it is not always the case that their planning, design, implementation and evaluation is based on best practice (Comcare 2012). Best practice suggests that such programs are well planned, have an early intervention and/or prevention focus, are designed and developed with very strong ownership and input from workers, that they are targeted at the stated needs of workers, are suitable for the workplace environment, are implemented and managed within a strong OHS policy framework, and they are regularly monitored and evaluated.

The review by Comcare found that there is an enormous amount of literature in relation to what might be described as 'best practice' guidance in planning, design, implementation and evaluation of health and wellbeing programs that can assist employers.

Bellew's (2008) review for the Victorian Department of Human Services identified a range of success factors for WHPs, which include:

- Senior management involvement
- Participatory planning
- Integrating Health Productivity Management/Workplace Health Promotion programs into the organisation's operations
- Strengthening the organisational climate for implementation by making sure that targeted employees have easy access to high-quality training, technical assistance and documentation
- Providing incentives for use and providing feedback on innovation use (all of which enhance motivation) and by making the innovation easily accessible or easy to use
- Giving targeted employees time to learn how to deliver and use the innovation, and redesigning work processes to fit innovation use (all of which increase opportunities or remove barriers)
- Simultaneously addressing individual, environmental, policy, and cultural factors affecting health and productivity
- Targeting several health issues
- Recognition that a person's health is determined by an interdependent set of factors
- Focusing primarily on employees' needs
- tailoring programs to address specific needs
- Attaining high participation.

The Commonwealth Government-sponsored National Preventative Health Taskforce's recent report (2009) cites research echoing the evidence that programs which integrate intervention on 'lifestyle' health behaviours and working conditions are more effective in protecting and improving worker health and wellbeing than isolated or single issue programs.

La Montagne (2009) examined a number of wellbeing programs and OHS systems across different government agencies in Australia, looking at whether recent initiatives represent international best practice and are effective in achieving their objectives. He concluded that current government initiatives fall short on linking (a) health behaviour change and (b) the improvement of working conditions as distinct chronic disease prevention strategies. La Montagne asserts that the initiatives fail to acknowledge and address occupational contributions to chronic disease burden. He advocates integrating health promotion and health protection through the awareness of combined effects of health behaviours and occupational exposures and emphasises the need for wellbeing programs to be implemented within a strong OHS system. This may increase worker motivation to change health behaviours and should increase employer and government motivation to reduce occupational exposures. He believes that employers should ensure that chronic disease prevention is the primary goal, with two main objectives; the improvement of health behaviours and the improvement of working conditions.

Policies (such as occupational health, health and safety, human resources, return to work agendas, canteen services/contracts and flexible working hours). The creation and adoption of such policies reaffirms both the organisation's and management's commitment to the program and help to ensure the long-term sustainability of the program.

Workplace health programs do not need to deliver all initiatives on site. Providing information on, or links to, local resources, providing advice and other information or resources (e.g. services of physical activity experts) could be sufficient.

Department of Sport and Recreation and Department of Health, Western Australia (2009) indicated that multi-component programs be developed according to the following principles:

- A workplace health program should aim to cover a multitude of different health-related issues and topics to ensure a variety of behavioural risk factors are addressed and to engage greater numbers of employees with different preferences/likes/dislikes and (health) needs
- Avoid an over emphasis of one approach to an issue; this will avoid excluding employees and any perceptions that the program is aimed at a narrow group of employees or one agenda (e.g. 'too sporty', 'only for older employees')
- Creating a 'supportive physical environment' within the workplace (e.g. the design, facilities and amenities) to support employees in making healthy lifestyle choices (such as to be more active and to eat healthier) should be viewed as an essential component of a workplace health program

- Changes (improvements) to the environment and policy demonstrates the organisation's commitment to supporting employees to improve their health
- Making changes to the workplace environment and policies is more difficult to achieve in the short-term; thus should be viewed as mid to long-term objectives. They both require significant management support and often greater levels of funding and resources
- Organisational policy to support healthy lifestyles should be developed to ensure long-term commitment, resourcing and sustainability. This can be integrated within one or more related policy areas.

Guiding principles (Health and Productivity Institute of Australia, 2011)

The work recently undertaken by the Health and Productivity Institute of Australia (HPIA 2010) provides a concise summary of many of the tips for a sustainable health program.

1. Active support and participation by senior leadership—this goes beyond endorsement and involves active and visible participation. CEOs and other senior leaders must embrace the creation of the vision or mission statement, walk the talk, hold management accountable through, for instance, KPIs; and reward success with incentives or public recognition
2. Workplace health as a shared responsibility—the effective delivery of wellbeing programs hinges on encouraging employers and employees to take and accept responsibility for health in the workplace. Employees who contribute financially to select initiatives, such as gym membership or smoking cessation, are more likely to adhere to programs
3. Engagement of key stakeholders—a healthy workplace is only attainable through the collaborative commitment of all stakeholders groups. Collaboration can be achieved by establishing a workplace health committee, appointing a health coordinator, and identifying and establishing workplace health partnerships with, for instance, external providers and not-for-profit organisations such as the Heart Foundation
4. Supportive environment—healthy choices should be easy choices. A company that undertakes a weight-management program but also provides high-fat, non-nutritious foods in vending machines and at meetings is unlikely to achieve long-term behaviour change. Healthy catering, flexible working arrangements and onsite facilities, such as showers and lockers, are key to a program's success
5. Participatory planning and design—employers must determine employee and organisational needs through a comprehensive needs assessment, develop programs in line with best-practice approaches and with the necessary providers and resources establish cost guidelines (usually \$100 to \$300 per employee per year) and 'make it happen' with strong leadership and an innovative communication and marketing strategy (see principle number 9)
6. Targeted workplace health interventions—a multi-faceted workplace health program can be broken down into core components, such as health assessments and flu vaccinations which are available to all employees,

discretionary components for high-risk workers, and local components that target the special needs of particular sites or job functions

7. Standards of accreditation—employers should ensure that internal and external health-program providers have a track record in the provision of such services, are members of a relevant industry body (such as HAPIA), use valid and reliable equipment or instruments and provide comprehensive reporting or evaluation
8. High levels of program engagement—the average participation rate among exemplary programs is 60 per cent, and can be achieved by conveniently integrating initiatives into the daily work schedule, keeping programs simple, clearly outlining goals and benefits, including family members where appropriate and ensuring privacy is respected
9. Innovative marketing and communication—creative marketing involves identifying employee needs and ‘selling’ the solution. Campaigns focusing on specific employee behaviours or characteristics such as age and sex are particularly effective
10. Evaluation and monitoring—evaluation is the cornerstone of a best-practice workplace health program. Comprehensive and ongoing evaluation is essential in measuring ROI and ensuring the program continues to meet the needs of employees and the organisation
11. Commitment to ethical business practices—including professional responsibility, confidentiality, professional competency and consumer protection
12. Sustainability—ensure programs are preventative in nature, as opposed to focusing on chronic disease management; avoid activity-oriented programs, concentrate on teaching self-sufficiency skills and set realistic short and long-term expectations

Earlier, Ackland et al. (2005) had indicated that consideration be given to an awards/recognition process to give due recognition to progressive organisations that have implemented successful WHPA (workplace health and physical activity) programs. They also considered that there be improved education, communication and advocacy to workplaces (in Western Australia) on the economic, social and health benefits of WHPA programs. They further considered that a coordinating entity be established to enquire, coordinate, lobby, educate and promote WHPA programs to employers and their workforce. This would involve establishing partnerships. This report also indicates practical ways in which government can create incentives and remove barriers for organisations to plan, implement or expand WHPPs; as well as methods in which processes can occur in regional, rural and remote communities.

Table 1. Summary of elements of best practice for workplace health promotion programs (synthesised list from those described by NICE 2004, Harvard School of Public Health, WHO/Joint Forum 2008, Quintiliani et al. 2008, WA 2009, Hooper and Bull 2009, HAPIA 2011)

Ensure senior management support (buy in)	<p>Necessary to generate the human and financial capital required to initiate and maintain a successful employee-driven health or wellness program. Management buy in and involvement (and practice-what-you-preach) is important to ensure long-term commitment. Management support and involvement visible to employees. Formalised workplace champions/advocate sponsors who help to plan and implement a WHPP and encourage employee engagement/ownership advantageous. Adequate provision for the coordination of a program necessary</p> <p>Active support and participation by senior leadership – this goes beyond endorsement and involves active and visible participation. CEOs and other senior leaders must embrace the creation of the vision or mission statement, walk the talk, hold management accountable through, for instance, KPIs; and reward success with incentives or public recognition</p>
Form employee advisory boards / participatory planning and implementation	<p>‘Employee ownership’ important. Wellness committees’ – exchange of ideas and can guide direction of specific intervention activities. Opportunity to reinforce how the program will be matched to business objectives (WHO 08). Allow for employee feedback and improvement</p> <p>Workplace health as a shared responsibility—the effective delivery of wellbeing programs hinges on encouraging employers and employees to take and accept responsibility for health in the workplace. Employees who contribute financially to select initiatives, such as gym membership or smoking cessation, are more likely to adhere to programs</p>
Effective communication	<p>Need to describe the framework or structure of WHP programs so that employees will be well-equipped to use them</p> <p>Communicating the aims and purpose of workplace health programs to employees is essential to build positive employee engagement</p> <ul style="list-style-type: none"> • Clear and frequent communication and use of multiple communication channels within the workplace to maximise reach to all employees is essential for success • The use of project branding can create an identity for the workplace health program that can help build recognition of the activities and raise employee awareness • >Utilising existing resources (e.g. newsletters, websites) and communication networks within the organisation can make the distribution of program information easier e.g. via email, posters in the work canteen and enclosures with employees’ payslips
Involve and engage key multiple stakeholders	<p>Bring different perspectives, skills, understanding, and resources Commitment needs to be made public and be sustained Academics, NGOs (e.g. Heart Foundation), local and state government, professional organisations, unions, employees, insurance providers, catering and food distributors, international organisations, civil society, sports industry</p> <p>Local strategic partnerships, trades unions, business federations and those organisations with a responsibility for increasing physical activity levels or for occupational health should provide support for those employers who want to implement workplace health promotion programs</p>

Link programs to business objectives/organisation's operations	By promoting health and risk factor reduction, businesses may avoid unnecessary health costs, enhance productivity, reduce absenteeism and turnover, encourage employees through demonstrated commitment to their well-being (WHO 2008)
Integrate the program into the organisation's structure	Optimise the use of onsite resources
Take an integrated approach to worker health that addresses occupational health and safety as well as health promotion	Integrating with existing business planning and values is important. Integrating into OHS ensures that a prevention focus is the guiding principal for all organisational efforts in this area. Embed health and wellness goals into corporate 'missions, 'values' or policies
Tailor programs based on employee needs and preferences as well as to particular setting	Run programs where participation is encouraged in a variety of ways. Programs need to be tailored to local need and circumstances. Different sized businesses will require different strategies. Conduct a needs assessment to identify employees interests, likes, dislikes to identify different needs
Address needs of all employees	Run integrated programs that represent the diversity of employee needs. Ensure equal access regardless of job type, level or individual characteristics
Build effective programs across the individual to environmental continuum/create supportive environments	
Establish clear goals and objectives	
Monitor and evaluate (then disseminate successful outcomes)	Evaluate programs to identify return on investment. Measures include process, output evaluation, HRA, health outcomes. Easy, innovative evaluation strategies are required by workplaces/organisations that invest in WHP. Allow for employee feedback and improvement. CDC has potential baseline, process, health outcomes and organisational change measures

Workplace guidelines/Best Practice guides/Resource kits

- **Healthy Workplace Guide: 10 steps to implementing a workplace health program (2011):**
National Heart Foundation of Australia
- **Exercise and Sports Science Australia (ESSA) (no publication date): Physical activity in the workplace: A guide**
- **Workplace Health Promotion: Case studies for creating a supportive environment for health**
This report describes the activities and findings of a workplace health promotion study conducted during 2010–11 in Victoria
- **HAPIA (The Health and Productivity Institute of Australia) (2011) Best-practice guidelines: workplace health in Australia**
Includes some informative best practice case studies
- **Effective Health and Wellbeing Programs – a Comcare literature review, Australian Government, Comcare (September 2010)**
This report outlines the design, development, implementation and evaluation of health and wellbeing programs in the workplace. It identifies best practice principles for the development of effective health and wellbeing programs and provides an overview of the claimed benefits associated with implementing such programs in the workplace, as well as some of the available evidence for these claims. The report also references guidance material from a number of state and territory jurisdictions
- **WorkSafe Victoria (2010) Healthy workplace kit: your guide to implementing health and wellbeing programs at work**
- **Western Australian Department of Sport and Recreation and Department of Health (2009) A resource kit for physical activity and health in the workplace**
- **ACT Work Safety Commissioner (2009) A guide to promoting health and wellbeing in the workplace**
- **Premier's Physical Activity Council – Tasmania (2007) Get moving at work: A resource kit for workplace health and wellbeing programs**
- **South Australian Office for Recreation and Sport (2006) Workplace physical activity kit**
- **The Alberta Centre for Active Living's Workplace Physical Activity Framework (2003)** is a resource designed to help workplaces plan and implement successful workplace physical activity programs. The framework uses an ecological perspective with five levels: the individual, social, organisational, community, and policy levels.

Websites

Centers for Disease Control and Prevention (CDC; Worksite Wellness Initiative)

<http://www.cdc.gov/nccdphp/dnpao/hwi/index.htm>

The Community Preventive Services Taskforce (Obesity Prevention and Control: Worksite Programs - Recommendations) <http://www.thecommunityguide.org/obesity/workprograms.html>

National Heart Foundation: Worksite Wellness Programs

<https://www.heartfoundation.org.au/active-living/get-active/Pages/Workplace-wellness.aspx>

California Department of Health Services

<http://www.cdph.ca.gov/programs/cpns/Documents/Network-FV-WP-FADWorksiteBrieffinal.pdf>